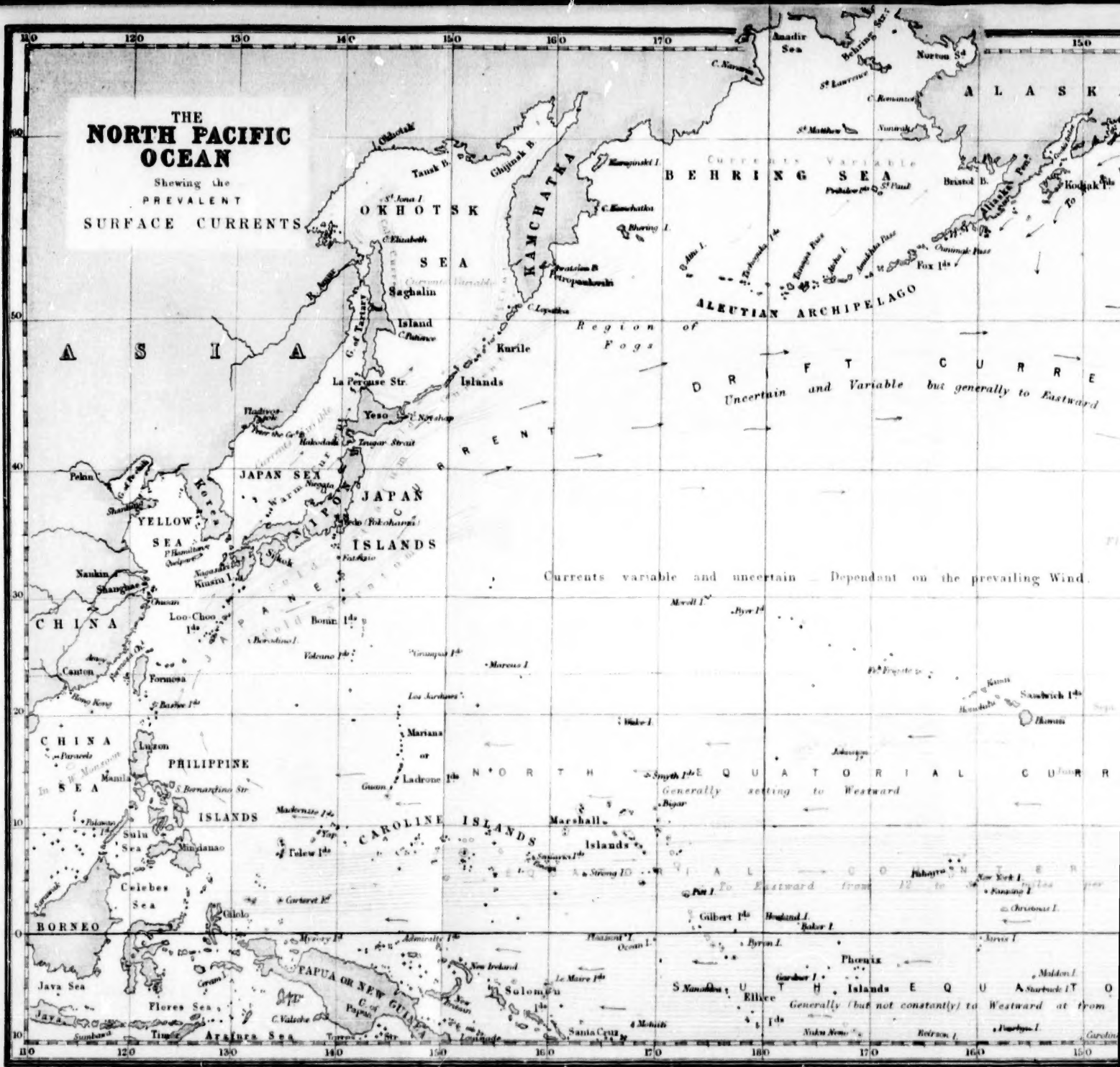
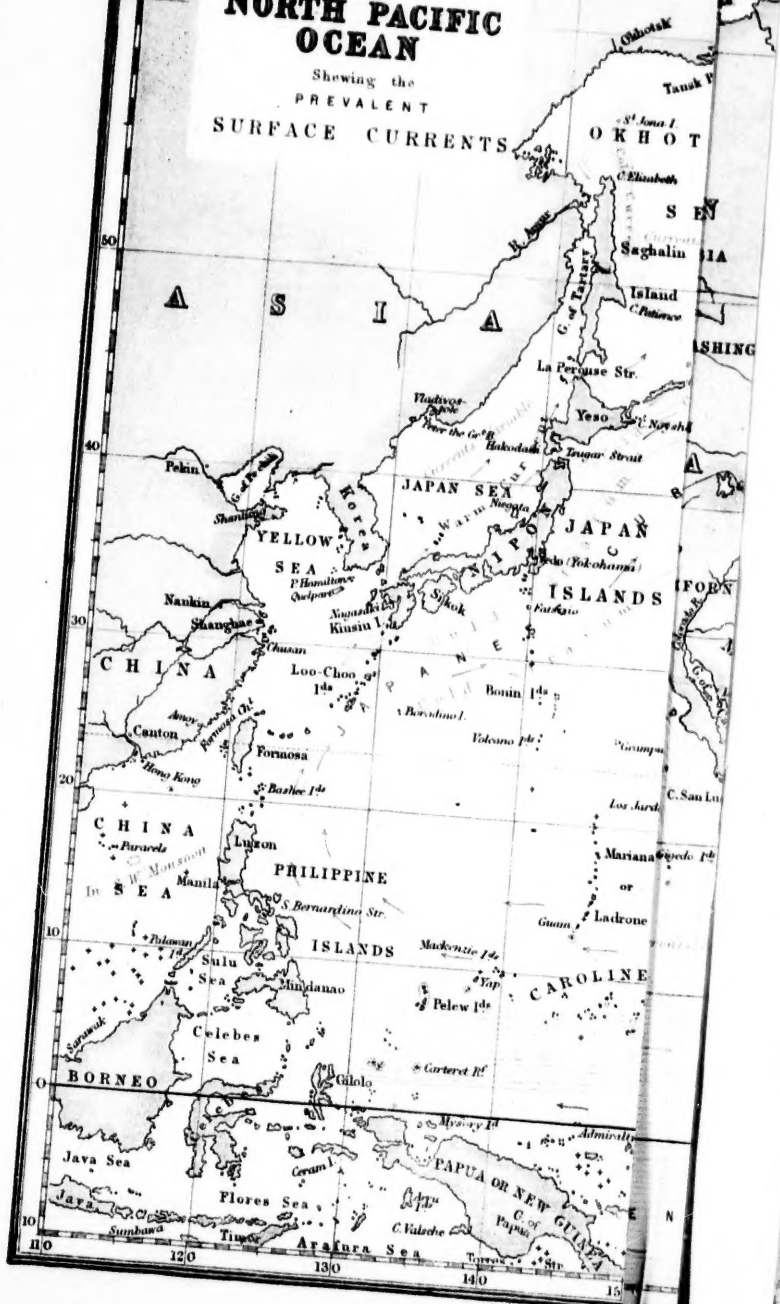


THE NORTH PACIFIC OCEAN

Showing the
PREVALENT
SURFACE CURRENTS



Showing the
PREVALENT
SURFACE CURRENTS



A
DIRECTORY
FOR THE NAVIGATION OF THE
NORTH PACIFIC OCEAN
WITH DESCRIPTIONS OF ITS
COASTS, ISLANDS, ETC.,
FROM
PANAMA TO BEHRING STRAIT,
AND
JAPAN;
ITS WINDS, CURRENTS, AND PASSAGES.



THIRD EDITION.
With ADDENDA 1898.

BY ALEXANDER GEORGE FINDLAY, F.R.G.S.,
Honorary Member of the Societa Geografica Italiana.

LONDON:
PUBLISHED BY RICHARD HOLMES LAURIE,
63, FLEET STREET, E.C.
1886.



GEOLOGICAL SURVEY
OF CANADA

ENTERED AT STATIONERS' HALL.

PRINTED BY RICHARD HOLMES LAURIE, 53, FLEET STREET, LONDON, E.C.

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PREFACE TO THE SECOND EDITION.

The period which has elapsed since the first edition of this work appeared, has had a more important influence on the social and commercial progress of the world than any recorded in history, and in no part has this change been more evident than in the countries around the North Pacific Ocean.

Twenty years ago California was little more than the hunting ground of the Indians; its ports and chief places were only occupied by a few indolent half-breed Spaniards. British Columbia and its primeval forests had been untrodden by civilized man. Behring Sea had not then been visited by the whaling-fleet, which has since drawn such enormous treasures from its waters. Russian Tartary and its great river Amur, one of the largest in the world, were unknown. Japan was a sealed empire, and the various archipelagoes scattered over its surface, teeming with people, were only visited on rare occasions for the pearl oyster or biche-de-mar they produced. How all this is changed, the brief notices scattered throughout this book will show.

The vast extension of steam navigation by the introduction of the screw propeller; the establishment of sub-oceanic telegraphy; the development of the gold-fields of Western America and Australia, and the consequent growth of the State of California; the opening of the vast empires of China and Japan to the world's commerce; the union of the Atlantic and Pacific coasts by the railway across the isthmus of Panama, and the Pacific Railway to San Francisco; the transfer to the United States of the Russian Territory in America; the more perfect organisation and development of the commerce with the islands; with innumerable other evidences of progress in all quarters, have so altered our relations with the remote

countries described in this volume, that the change is astonishing when it is considered in how short a period it has been effected.

The present work then refers to a much more important subject than was the case with the preceding edition; and, with its increase of interest, the improved knowledge of its hydrography will be found to have kept pace. As stated in the introduction to the South Pacific Directory, this edition is differently arranged to the first. In that, the first part referred to the coasts, the second to the islands of the Pacific Ocean. These later editions separate the oceans by the Equator, and each volume describes the area North or South of it, and is thus complete in itself, although they are supplementary to each other.

It is scarcely necessary to recount the steps which have been made in our knowledge of the Pacific and its coasts. Up to a very recent time the recital of each voyage was a tale of discovery and adventure. Many of them are familiar household stories. Captain *Cook's* voyage is scarcely forgotten as a narrative; yet not a century since he commenced the real work of correctly describing the Pacific. The voyages and surveys of *Vancouver*, 1791 to 1794, are still the best authority for the coasts of Alaska and British Columbia. At the same period the Spaniards had sent the well known commanders *Galiano* and *Valdez*, and also the unfortunate *Malaspina*, and his companion *Bustamente*; these are deserving of all good mention. They examined much of the Western coast of America.

Admiral *Krusenstern*, the hydrographer of the Pacific, follows next in order, and he first gave a correct notion of Japan, Okhotsk, and the adjacent parts of Asia (in 1803—1806); and, most important of all, has left an invaluable and noble work on the Pacific (1824, 1827), to which very many of the subsequent pages are indebted.

To another Russian officer, Captain *Frédéric Lutke*, we still are almost solely indebted for what we know of the inclement Sea of Behring, and of much of the Caroline Archipelago. A third, *Otto Von Kotzebue*, was sent by the Russian Government to the North Pacific in 1815—1818, and surveyed the Marshall Islands and other parts.

Of our own countrymen, in later times, the late Admiral *Frederick William Beechey*, stands prominent. His voyage in the *Blossom*, 1826—

PREFACE.

1828, is in a scientific point of view one of the most important. He fixed many positions on the American coast, surveyed Behring Strait, the Sandwich Islands, the Lu-chu Islands, &c. The same commander afterwards, in 1835-6, again went to the Pacific, in the *Sulphur*, but being invalided, he resigned his command to Captain, afterwards *Sir Edward Belcher*. The *Sulphur* did excellent service in reconciling many points in doubt, in surveying many other places of great importance, and adding a great fund of information to North Pacific hydrography. While the *Sulphur* was thus employed, the French frigate *La Venus*, under Captain *A. Du Petit Thouars*, in 1837-8, collected a great amount of valuable information on the whale fishery, besides surveying and determining the positions of many places.

Omitting many minor authorities, the noble work of *Von Siebold* on Japan, published by the Dutch Government, 1823-30, deserves all admiration, and is worthy of a nation. Another truly national undertaking was the *United States Exploring Expedition*, organized under Commodore *Charles Wilkes*, 1838. The works of this important surveying squadron need not to be further alluded to.

Later than this we may notice the voyage of the *Herald*, under Captain *Kellett*, R.N., and his three voyages to the Arctic Sea, as chronicled by *Dr. Berthold Seemann*, 1845-51. These and many other works are duly acknowledged as our authorities.

Since the period when the foregoing voyages were undertaken, the great changes before alluded to have come over the countries bordering on the North Pacific. Commencing with Central America, we have made use of the work of Captain *De Rosencoe* of the *L'Obligado*, on the province of Veraguas, in 1854, and of the observations of *M. De Lapelin*, of the French corvette *La Brillante*, 1852.

On the cession by treaty of the Californian territory to the United States, that Government immediately took measures (1848) to acquire a better knowledge of its coasts, and the ultimate result was the perfect directory drawn up by Assistant *Geo. Davidson*, U.S.N., from the surveys and observations of the U.S. Coast Survey in 1863, chiefly under Commanders *W. A. Bartlett*, *McArthur*, and *Jas. Alden*, U.S.N., 1848-1858.

These directions, comprised in Chapter IV., are invaluable, and embody all previous observations.

The shores of Juan de Fuca Strait were surveyed by Captain *Kellett* in 1847. Vancouver's work supplies the basis of our present knowledge of the inlets to the S.E. of it.

Vancouver's Island and the adjacent shores of the continent were admirably and minutely surveyed by Captain *G. H. Richards*, R.N., C.B., 1859—1865, assisted by several meritorious officers, of whom Captain *R. C. Mayne* and Messrs. *J. A. Bull* and *D. Pender* may be mentioned. The Vancouver Island Pilot, drawn up from the observations thus collected, forms the basis of Chapters V. and VI. It will be seen that we have added many important details from the very interesting works of *Lord Milton*, *Captain Mayne*, *Mr. Whympere*, and other adventurous and recent travellers. To the North of this Vancouver's work still remains the chief authority.

Of Alaska, the older authorities are still the chief, but of the Sitka Archipelago the Russian officers have made much better charts, published in 1848—1850, chiefly from the surveys of Capt. *Yassilief*. Of the remainder of the territory of Alaska it is gratifying to find that our first edition is still considered to be useful, for the United States' Government have recently reprinted that portion as a guide for their newly acquired territory.

Proceeding to the north-west, the chief advances made in the hydrography arose out of the French and English Expeditions to China in 1854-7, and, for the new Russian possessions, their surveys of 1849—1854.

Our knowledge of Japan has greatly and rapidly improved. It may be said to have commenced with Commodore *Perry's* U.S. Expedition in 1853-4. The singular circumstances related on pages 782-783 as to a remarkable and excellent native map, will be of great interest. It was drawn up by the astronomer *Takapasi Lakusaimon*, who destroyed himself when it was discovered that he had furnished a copy to a European resident. This has served in many parts as a basis of our knowledge, and this, with the surveys of Commanders *Ward* and *Brooker*, R.N., and especially of Commander *Charles Bullock*, R.N., will appear as exact and perfect representations of the places of greatest interest.

Of the islands and archipelagoes which are dispersed over the surface of the North Pacific we cannot speak here in detail. Their positions and the descriptions of their characteristics are derived in each case frequently from many sources, which are duly stated.

To the authorities here enumerated, and to many others whose observations are distributed throughout the following pages, our especial thanks and acknowledgments are rendered.

This volume has been long delayed. Many avocations have prevented the author till now from devoting that time to it which the importance of its topics would command. However, in now offering it to the nautical world, he trusts that no source of information has been overlooked, and that the book will be found to be deserving of their confidence. It is the last of a series of six volumes bearing the Editor's name, which comprehend a description of the whole ocean-world. And thus completing his labours, he would express the gratification it has been through many years to collect and arrange the materials thus submitted.

A. G. FINDLAY.

London, September 1st, 1870.

Since the foregoing Preface was written many changes have taken place, as in other parts of the world, on the coasts and islands of the North Pacific Ocean. The great extension of steam and railway communication on the North American continent, and the opening up of coal deposits in various parts, has led to the settlement of new districts, and the rising up of flourishing towns and villages in places which were almost unvisited at the period when the previous edition of this work was published. Our knowledge of the Coasts, Islands, and Archipelagoes, has also been much increased by the researches of Nautical Surveyors and others, who are mentioned in the introductory remarks at the commencement of each Chapter and in the Notes. The incorporation of the mass of information thus available has led to a material increase in the size of the Work, and it is trusted that no useful source of information has been overlooked, to render it a worthy companion of the Author's volumes on the other great Oceans.

W. R. K.

London, January 1st, 1886.

CONTENTS.

SECTION I.

	PAGE
PREFACE.....	iii
TABLE OF GEOGRAPHICAL POSITIONS.....	xi

SECTION II.

CHAPTER I.—THE COAST OF CENTRAL AMERICA.....	1—80
1. THE COAST OF COLOMBIA: PANAMA TO POINT BURICA ..	6
2. Costa Rica, ..	31
3. Nicaragua ..	44
4. San Salvador.....	64
5. Guatemala.....	75
CHAPTER II.—THE WEST COAST OF MEXICO, BETWEEN TEHUANTEPEC AND MAZATLAN	81—126
CHAPTER III.—THE GULF AND PENINSULA OF LOWER CALIFORNIA	127—203
CHAPTER IV.—THE COAST OF CALIFORNIA.....	204—276
CHAPTER V.—THE COAST OF OREGON, ETC., FROM CHET-KO RIVER TO ADMIRALTY INLET.....	277—348

CONTENTS.

ix

CHAPTER VI.—VANCOUVER ISLAND, ETC.....	PAGE 349—453
CHAPTER VII.—BRITISH COLUMBIA, ETC.	454—589
CHAPTER VIII.—THE COAST OF ALASKA, FROM PORT- LAND CANAL TO THE KODIAK ARCHIPELAGO ..	590—660
CHAPTER IX.—THE ALEUTIAN ISLANDS AND BEHRING SEA	661—723
CHAPTER X.—KAMCHATKA, OKHOTSK, AND THE KU- RILE ARCHIPELAGO	724—776
CHAPTER XI.—THE JAPANESE ARCHIPELAGO	777—917

SECTION III.

THE ISLANDS OF THE NORTH PACIFIC OCEAN

CHAPTER XII.—ISLANDS BETWEEN THE EQUATOR AND LAT. 10° N.....	923—1027
The Gilbert Archipelago	935
The Marshall Archipelago	950
The Caroline Archipelago.....	970
The Palau or Pelew Islands.....	1008
CHAPTER XIII.—ISLANDS BETWEEN LAT. 10° AND 20° N., INCLUDING THE MARIANA OR LADRONE ISLANDS	1028—1061
CHAPTER XIV.—ISLANDS TO THE NORTHWARD OF LAT. 20° N., INCLUDING THE HAWAIIAN OR SANDWICH ISLANDS	1062—1163

North Pacific.

THE PHENOMENA OF, AND DIRECTIONS FOR
THE NORTH PACIFIC OCEAN.

CHAPTER XV.—THE WINDS OF THE NORTH PACIFIC OCEAN	PAGE 1166
CHAPTER XVI.—THE CURRENTS OF THE NORTH PACIFIC OCEAN.....	1194
CHAPTER XVII.—I.—1. TIDES, WITH TIDE TABLES	1219
2. Magnetic Variation	1228
3. Ice	1229
II.—1. Density of Ocean Water.....	1230
2. Temperature	1231
3. Depth of the Ocean	1232
CHAPTER XVIII.—PASSAGES	1234
ALPHABETICAL INDEX	1268

ILLUSTRATIONS.

1. Prevalent Surface Currents.....	To face Title
2. The Isthmus of Panama	" page 7
3. View of the Volcano of Coseguina	" 60
4. San Francisco Harbour.....	" 239
5. The Strait of Juan de Fuca, Admiralty Inlet, and Puget Sound.....	" 321
6. Esequimalt and Victoria Harbours	" 397
7. View of Mount St. Elias	" 639
8. China and Japan	" 777
9. Seto Uchi, or Inland Sea of Japan.....	" 789
10. Approaches to the Bay of Yedo	" 825
11. The Hawaiian or Sandwich Islands	" 1063
12. Honolulu Harbour	" 1095
13. View of Honolulu	" 1096
14. Winds of the North Pacific Ocean	" 1165
15. Winds of the Central Pacific Ocean (40° N. to 45° S.)	" 1192
16. Currents and Whaling Grounds of the Pacific Ocean.....	" 1195
17. Magnetic Variation and Dip, 1886.....	" 1225
18. Bottom Chart.....	" 1233
19. Passages in the North Pacific Ocean	" 1235

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TABLE OF GEOGRAPHICAL POSITIONS
IN THE
NORTH PACIFIC OCEAN.

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Garachine I
 Patino Point
 Darien Harb
 Brava Point
 Pajaros Islas
 San José Ba
 Galera Island
 Isla del Rey
 Gonzales Isl
 San José Isl
 Saboga Island
 Pelado Island
 Chepillo Islas
 PANAMA, C
 N.E. bastion
 Flamenco Isl
 Bona Island,
 Point Chamé,
 Parita Bay, L
 Iguana Island
 Cape Mala, ex
 Los Frailes, S
 Mariato Point
 Montijo Bay,
 East point of
 Coiba Island
 Hermosa or
 Hicarita, South
 Bahía Honda,
 Contreras, Brin
 Port Pueblo N
 Perdo
 Secas Isanua,
 David Bay, Sal
 Palenque Island
 Parida Id., water
 Ladrone Island
 Montuosa, S.E.
 Burica Point, B
 Gulf of Dulce, C
 Punta Arenita
 Sal-si-puedes Po
 Point Llorena, C
 Cano Island, W
 Point Mala
 Quepos Point
 Mount Judas
 Port Herradura,

TABLE OF GEOGRAPHICAL POSITIONS.

*. * Many of the positions here given are only approximate ; the longitudes have been corrected from the latest Authorities.

	Lat. North.	Long. West.	Authorities.	Page
CENTRAL AMERICA.				
Garachine Point, N.E. extreme -	8 6 0	78 22 15	The Survey by	6
Patino Point, centre of islet -	8 16 0	78 17 45	Capt. H. Kellett,	6
Darion Harbour, Graham Point	8 28 50	78 5 40	R.N., C.B., and	6
Brava Point, West extreme -	8 20 36	78 25 30	Com. Jas. Wood,	8
Pajaros Islands, N.W. Island -	8 32 20	78 33 10	R.N., 1845-49.	8
San José Bank, Trollope Rock -	8 6 40	78 38 50	"	7
Galera Island, centre -	8 11 20	78 46 45	"	9
Isla del Rey, extreme of Cocos Point	8 12 30	78 54 45	"	9
Gonzales Island, North head -	8 25 30	79 7 15	"	9
San José Island, Iguaza Point -	8 18 25	79 7 30	"	10
Saboga Island, West point -	8 37 10	79 4 50	"	7
Pelado Island, centre -	8 37 35	78 42 30	"	11
Chepillo Island, centre -	8 56 32	79 8 0	"	11
PANAMA, Cath., S.E. angle of S. tower -	8 57 6	79 32 12	Com. F.M. Green.	11
N.E. bastion -	8 56 56	79 31 9	The Survey by	11
Flamenco Island, North point -	8 54 30	79 31 20	Capt. H. Kellett,	14
Bona Island, peak -	8 34 0	79 35 5	and Comm. J.	17
Point Chamé, extreme -	8 39 0	79 41 30	Wood.	17
Parita Bay, Liso Point -	8 58 10	80 21 50	"	17
Iguana Island, centre -	7 27 5	80 0 15	"	17
Cape Mala, extreme -	7 27 40	79 59 45	"	17
Los Frailes, South Rock -	7 19 40	80 8 15	"	18
Mariato Point, S.W. extreme -	7 12 0	80 52 45	"	18
Montijo Bay, S.W. pt. of Gobernador Id.	7 32 15	81 12 45	"	18
East point of Cebaco Island -	7 33 30	81 1 45	"	18
Coiba Island, Damas Bay, Fea Point	7 23 45	81 37 25	"	19
Hermosa or West point -	7 31 10	81 52 30	"	19
Hicarita, South point -	7 12 30	81 46 50	"	20
Bahia Honda, Sentinela Island -	7 42 45	81 32 0	"	21
Contreras, Brincano Island, North point	7 52 0	84 47 15	"	23
Port Pueblo Nuevo, Rocks of Magnetic I.	8 4 39	81 48 0	"	24
Perdo - Intrusa Island -	8 4 54	81 43 0	De Rosencourt.	25
Secas Islands, La Bruga Rock -	7 59 0	81 58 45	Kellett & Wood.	26
David Bay, Saino Island, South side	8 11 52	82 12 8	De Rosencourt.	28
Palenque Island, Deer Island, off S.E. pt.	8 10 13	82 14 50	Kellett & Wood.	28
Parida Id., watering-place in Chinmo Bay	8 5 50	82 21 45	"	29
Ladrones Islands, South Isle -	7 51 45	82 26 30	Kellett.	30
Montuosa, S.E. end -	7 27 35	82 14 30	"	30
Burica Point, Burica Island off it	8 1 0	82 56 30	"	30
Gulf of Dulce, Cape Matapalo -	8 17 0	83 23 30	M. de Lapeyrouse,	32
Punta Arenitas -	8 32 0	83 21 15	1857.	32
Sal-si-puedes Point, S.W. extreme	8 25 15	83 40 30	"	34
Point Liorena, extreme -	8 36 0	83 48 30	"	34
Cano Island, West point -	8 42 45	83 57 20	"	35
Point Mala -	9 7 15	83 41 15	"	35
Quepos Point -	9 25 0	84 8 35	"	36
Mount Judas -	9 31 20	84 31 30	"	36
Port Herradura, lake on beach -	9 38 30	84 39 30	Sir E. Belcher.	36

TABLE OF GEOGRAPHICAL POSITIONS.

	Lat. North.	Long. West.	Authorities.	Page
Gulf of Nicoya, Blanco Island off cape	9 32 45	85 8 15	Sir E. Belcher.	37
Calders, hot springs	9 54 25	84 42 15	"	37
Pan de Azucar	9 55 45	84 53 45	"	39
Punta Arenas, lighthouse	9 58 50	84 49 30	"	39
Cape Velas	10 19 0	85 54 0	"	41
Gorda Point	10 32 0	85 47 0	"	41
Port Culebra, river at head of port	10 36 55	85 38 0	"	42
Cape Elena	10 53 15	85 51 0	"	43
Salinas Bay, Salinas Island	11 2 50	85 43 40	"	44
San Juan del Sur, inner South point	11 15 30	85 53 30	"	45
Cape Desolada	11 58 20	86 40 40	"	48
Corinto or Realejo, Cardon Id. lighthouse	12 27 55	87 12 15	"	53
Fonseca Gulf; Cosaguina Volcano	12 58 0	87 34 30	"	59
Port La Union, Chicarena Point	13 17 5	87 47 5	"	60
Port Jiquilisco, East point	13 9 20	88 27 40	Comm. Philip.	66
River Lempa, East point	13 12 15	88 48 30	"	67
Volcan de S. Miguel, 6,822 ft.	13 26 0	88 17 20	"	68
Port Libertad, Custom-house	13 29 0	89 19 20	"	68
City of San Salvador	13 50 0	89 1 30	Chart.	69
Port Acajutla, or Sonsonate, light on mole	13 34 20	89 50 45	"	72
Isalco Volcano	13 47 0	89 40 0	Lapelin.	73
Port Istapa or Istapam	13 54 0	90 41 0	"	75
Volcan de Agua	14 32 50	90 44 0	"	77
Volcan de Fuego	14 33 0	90 52 0	"	77
San José de Guatemala, Observation spot	13 55 19	90 49 48	U.S. Survey, 1879.	77
Champerico	14 17 44	91 55 36	"	80
WEST COAST OF MEXICO.				
Soconusco Bar	15 25 0	93 3 0	Chart.	86
Boca Barra, about	16 12 0	94 45 0	Trastour.	87
Ventosa Bay, Morro	16 11 0	95 8 30	U.S. Survey, 1879.	87
Salina Cruz Bay, Morro	16 9 49	95 12 31	"	88
Bay of Bamba, Punta de Chipecua	16 1 20	95 22 30	"	89
Morro of Ytapa, or Ayuca	15 52 0	95 46 44	"	89
Port Guatulo, Observation spot	15 44 58	96 8 12	"	93
Port Sacrificios, West point	15 40 41	96 15 4	"	95
Puerto Angel or Port Angeles, East point	15 39 9	96 30 30	"	95
Alcatraz Rocks	15 58 0	97 25 0	Chart.	96
Maldonado Point, El Recodo	16 18 40	98 32 0	U. S. Survey.	96
Acapulco, Town of, Fort S. Diego	16 50 56	99 56 0	Sir E. Belcher.	99
Paps of Coyuca	17 2 0	100 5 0	Chart.	99
Tequepa or Papanoa	17 16 6	101 4 32	U.S. Survey, 1879.	102
Potatlan, sandy isthmus	17 31 29	101 26 54	"	102
Port Sihuantanejo, head of port	17 37 56	101 33 3	"	102
Istapa Island, N.W. summit	17 40 17	101 40 4	"	103
Mangrove Bluff	17 54 5	102 17 0	G. H. Richards.	103
Tejupan Point	18 22 0	103 34 45	"	103
Marnata	18 27 0	103 33 0	Mainwaring.	104
Manzanilla Bay, West end of village	19 3 13	104 20 41	G. H. Richards.	104
Navidad Bay, North beach	19 13 0	104 44 27	"	107
Porula Bay, Observation Cove, N. point	19 34 31	105 9 35	"	109
Cape Corrientes, extremity	20 24 40	105 43 2	U. S. Survey.	110
Point Mita, extremity	20 45 50	105 33 37	"	111
La Corvetana Rock	20 44 15	105 51 0	"	112
Tres Marias Ids., S. Juanito Id. N. point	21 45 0	106 42 0	"	113
Piedra Blanca del Mar	21 34 30	106 30 0	Beechey.	114
San Blas, Custom-house	21 32 30	105 18 40	U. S. Survey.	114
Isabel Island	21 52 15	105 53 30	"	120
Boca Tecapan, Palmita village	22 30 26	105 44 25	"	120
Rio Chametla, or del Rosario, W. point	22 48 0	105 2 0	"	120
MAZATLAN, signal station	23 11 17	106 26 39	"	121
Piastla Point	23 38 42	106 49 50	"	131

Culia
Altat
San I
Point
Estero
c
Point
Lobos
Rio Ya
Guaym
Cape I
Tetas d
San Pe
Tiburón
George
Rio Col

Angel de
Angeles
San Fran
Cape de l
Muleje B
Point Cor
Pulpito P
Point Mar
Loreto, Ca
Carmen Ju
Santa Cata
San Josef
Espiritu S
La Paz, S.
Coralbo Isl
S. José del
Cape San L
Obs. spot
Magdalena
Cape San L
Alijos Rock
Boca de Sol
San Juanico
Point Abre
Auncion Is
San Bartolo
Cerro Id., I
San Benito I
Playa Maria
San Geronim
Port San Qu
San Martin I
Cape Colnett
Todos los San
Los Coronado

COAST

San Diego Ba
Point Loma
San Luis Rey,

TABLE OF GEOGRAPHICAL POSITIONS.

xiii

	Lat. North.	Long. West.	Authorities.	Page
Culiacan Shoals, S.W. edge -	24 37 0	108 1 30	U.S. Survey.	132
Altata, Observation spot -	24 37 45	107 56 7	U.S.S. <i>Ranger</i> .	133
San Ignacio Island -	25 26 0	109 24 0	U.S. Survey.	135
Point San Ignacio -	25 36 0	109 23 30	"	135
Estero de Agiabampo, Obs. Hill, S.E. side				
c. entrance -	26 16 18	109 17 20	Townshend.	135
Point Rosa -	26 40 0	109 38 0	U.S. Survey.	136
Lobos Island, Monte Verde -	27 20 15	110 36 35	"	136
Rio Yaqui, South entrance point	27 36 30	110 36 0	"	136
Guaymas, signal station -	27 55 53	110 55 13	"	137
Cape Haro -	27 50 0	110 51 30	"	138
Tetas de Cabra, or Paps -	27 56 30	111 3 30	"	141
San Pedro Nolasco, North end -	27 59 0	111 22 0	"	141
Tiburón Island, South end -	28 45 55	112 41 55	"	141
George Island, N.E. shore -	31 0 54	113 16 30	"	143
Rio Colorado, Invincible Point -	31 55 0	115 0 0	"	145

LOWER CALIFORNIA.

Angel de la Guardia Island, South point -	28 58 0	113 5 30	U.S. Survey.	148
Angeles Bay, light on N.W. shore	28 56 39	113 34 35	"	149
San Francisco Point -	28 28 30	112 51 30	"	152
Cape de las Virgenes, monument S.E. of	28 30 30	112 17 30	"	153
Muleje Bay, Equipalto Point -	26 53 37	111 58 4	"	155
Point Concepcion -	26 53 0	111 4 0	"	157
Pulpito Point, summit -	26 30 44	111 1/2 14	"	158
Point Mangiles -	26 16 30	111 20 0	"	159
Loreto, Cathedral -	26 0 41	111 21 3	"	159
Carmen Id. Salinas Bay, beach in N.E. pt.	25 59 37	111 6 53	"	162
Santa Catalina Island, North point	25 42 0	110 47 0	"	163
San Josef Island, Amortajada Bay, N. pt.	24 54 30	110 35 40	Kellett.	165
Espiritu Santo Island, Lupona or S. point.	24 24 10	110 21 45	U. S. Survey.	166
La Paz, S.E. extreme of El Mogote	24 10 10	110 20 41	"	168
Ceralbo Island, No. h end -	24 22 0	109 56 30	"	172
S. José del Cabo, N.E. side of entrance	23 3 35	109 40 43	"	175
Cape San Lucas, Eastern Rock	22 52 36	109 54 0	"	177
Obs. spot, S.W. of Custom-house	22 53 21	109 54 41	"	177
Magdalena Bay, Man-of-War Cove	24 38 22	112 8 50	"	182
Cape San Lazaro -	24 48 0	112 18 0	"	185
Alifios Rocks, South rock -	24 58 8	115 44 47	"	185
Boca de Soledad -	25 16 0	112 4 0	"	186
Boca de las Animas -	25 39 30	112 3 0	"	186
San Juanico Point -	26 2 30	112 14 30	"	186
Point Abreojos, extreme of rocky ledge	24 42 28	113 34 54	"	188
Asuncion Island, North end -	27 5 58	114 18 21	"	189
San Bartolomé, or Turtle Bay, N. head	27 39 35	114 54 27	"	191
Cerro Id., 1 mile northward of S. point	28 1 49	115 11 3	"	192
San Benito Islands, summit of W. island	28 18 8	115 36 10	"	194
Playa Maria Bay, mound on West side	28 54 51	114 31 46	"	196
San Geronimo Island, light at East end	29 47 11	115 47 45	"	197
Port San Quentin, Sextant Point	30 22 15	115 59 7	"	199
San Martin Island, N.W. point	30 29 45	116 6 0	"	199
Cape Colnett, S.W. point -	30 57 0	116 18 30	"	200
Todos los Santos Bay, Ensenada anch.	31 51 30	116 36 0	"	201
Los Coronados Islets, centre of highest	32 23 46	117 13 21	Davidson.	203

COAST OF CALIFORNIA.

San Diego Bay, boundary obelisk	32 21 53	117 7 32	The Survey by	208
Point Loma, lighthouse -	32 40 14	117 14 38	the United States	210
San Luis Rey, anchorage off -	33 16 0	117 31 0	officers.	211

	Lat. North.	Long. West.	Authorities.	Page
San Juan Capistrano, anchorage off -	33 26 45	117 44 0	The Survey by	211
San Pedro Bay, lightho. on Formin Point -	33 42 0	118 18 0	the U. S. officers	212
Wilmington, bluff at landing -	33 43 20	118 16 3	under Lieut. W.	213
Santa Monica, hotel -	34 0 35	118 37 40	A. Bartlett, 1849;	214
Point Hueneme, lighthouse -	34 9 0	119 13 0	Comm. J. Alden,	215
Buenaventura Mission -	34 15 0	119 15 0	1853; and Assis-	216
Santa Barbara, lighthouse -	34 23 35	119 42 5	tant Geo. David-	216
Point Concepcion, lighthouse -	34 26 47	120 28 0	son, 1863; &c.	217
El Coto, bluff -	34 26 56	120 28 33	"	218
Cortes Shoal, Bishop Rock 15 ft. -	32 25 45	119 5 0	"	219
San Clemente Island, S.E. point -	32 50 30	118 21 0	"	220
Sta. Catalina Id., Raper Bay, Alcatraz Id. -	33 27 0	118 24 20	"	221
Santa Barbara Island, summit -	33 30 0	119 2 0	"	222
San Nicolas Island, S.E. point -	33 13 0	119 26 0	"	222
John Begg Rock, 40 ft. high -	33 22 30	119 40 30	"	223
Anacapa Island, East end -	34 1 0	119 20 0	"	223
Sta. Cruz Id., Anacapa Bay, Obs. Point -	34 1 19	119 26 57	"	224
Santa Rosa Island, W. point -	34 0 0	120 10 0	"	225
S. Miguel I., Cuyler Hr., strm. in S.W. pt. -	34 2 15	120 15 0	"	226
San Luis Obispo, Whaler Island -	35 9 23	120 45 0	"	227
San Simeon, beach at head -	35 38 24	121 11 0	"	229
Point Pinos, lighthouse -	36 37 58	121 56 0	"	231
MONTREY, Custom-house wharf -	36 36 17	121 52 27	"	232
Santa Cruz, light -	36 56 56	122 1 33	"	234
Pigeon Point, lighthouse -	37 11 0	122 23 30	"	235
SAN FRANCISCO, Point Bonita lightho. -	37 48 48	122 31 44	"	241
Fort Point, lighthouse -	37 48 32	122 28 36	"	242
Telegraph Hill, near Observatory -	37 47 53	122 24 15	"	245
Presidio -	37 47 29	122 27 50	"	244
Sir Francis Drake's Bay, W. point -	37 59 20	122 58 0	"	255
Point Reyes, lighthouse -	37 59 36	123 1 21	"	256
South Farallon lighthouse -	37 41 49	123 0 4	"	258
North Farallon -	37 46 1	123 6 25	"	258
Bodega Head, summit 1 mile from extreme -	38 19 0	123 4 0	"	260
Bodega Bay, Fort Ross -	38 30 0	123 13 0	"	262
Point Arena, lighthouse -	38 57 10	123 44 42	"	264
Mendocino City, N. entrance point -	39 18 0	123 48 32	"	265
Shelter Cove, S.E. part of bluff -	40 1 0	124 3 3	"	266
Cape Mendocino, lighthouse -	40 26 21	124 24 14	"	266
Humboldt Bay, lighthouse on North spit -	40 46 4	124 13 6	"	269
Trinidad Head, lighthouse -	41 3 4	124 8 56	"	271
Klamath River, entrance -	41 33 0	124 5 0	"	272
Crescent City Bay, lighthouse -	41 44 34	124 12 22	"	274
Pelican Bay, entrance of Smith River -	41 57 0	124 13 0	"	275
Mount Shasta, summit -	41 20 0	121 45 0	"	276
COAST OF OREGON, ETC.				
Mack Arch -	42 13 37	124 24 46	"	280
Port Orford, summit of West point -	42 44 0	124 30 0	"	282
Cape Orford or Blanco, lighthouse -	42 50 7	124 33 2	"	284
Coquille River, entrance -	43 8 0	124 25 0	"	285
Koon Bay, Cape Gregory or Arago, ltho. -	43 20 38	124 22 11	"	286
Umpqua River, entrance -	43 41 0	124 12 0	"	288
Cape Perpetua -	44 19 0	124 6 0	"	290
Yaquina River, Newport -	44 40 30	124 4 45	"	291
Yaquina Head, lighthouse -	44 43 30	124 5 0	"	292
Cape Lookout -	45 21 0	123 58 30	"	293
Cape Meares -	45 30 0	123 57 30	"	294
Tillamook Bay, entrance -	45 34 0	123 56 0	"	294
Tillamook Rock, lighthouse -	45 56 10	124 1 10	"	296
Columbia River, Point Adams, lighthouse -	46 12 0	123 58 0	"	300
Cape Disappointment, lighthouse -	46 16 33	124 3 11	"	301
Astor Point, Astoria -	46 11 28	123 49 32	"	306

W. A.
S.
C.
G.
P.
D.
JUAN
Ca.
Ne.
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Ne.
Blu.
ADMIR.
Wh.
Poi.
Daw.
Rest.
Taco.
Steil.
Budd.
Whid.
Lunar.
Semin.
Lopez.
San J.
V.
Port San.
Sooke Inl.
Race Islan.
Esquimalt.
VICTORIA.
Barclay So.
Observa.
Obs. Id.
Clayoquot.
Refuge.
Heaquiat.
Estevan Po.
Nootka So.
Nuchatlitis.
Islet.
Esperanza.
Kyuquot So.
of Nar.
Naspart In.
Cape Cook.
Klaskino In.
Quastino So.
Observa.
BR.
Point Robert.
Fraser River.
Garry Point.
New West.
Burard Inlet.
English Ba.

TABLE OF GEOGRAPHICAL POSITIONS.

xv

	Lat. North.	Long. West.	Authorities.	Page
WASHINGTON TERRITORY.				
Shoalwater Bay, Leadbetter or Low Pt.	46 39 0	124 2 0	U. S. Survey.	312
Cape Shoalwater, lighthouse	46 43 4	124 4 28		312
Gray Harbour, Fort Chohalia.	46 53 44	124 6 54		315
Point Grenville, bluff	47 19 0	124 14 0		318
Destruction Island	47 41 0	124 27 0	"	319
JUAN DE FUCA STRAIT.				
Cape Flattery, lightho. on Tatoueh Id.	48 23 15	124 44 40	Capt. Kellett.	326
Neesh Bay, Obs. pt., Wyadda Island	48 22 30	124 36 23		327
Port Angeles, Edis Hook lighthouse	48 8 0	123 25 30	U. S. Survey.	329
New Dungeness, lighthouse	48 10 59	123 6 7	"	330
Blunt or Smith Island, lighthouse	48 18 50	122 51 30	"	352
ADMIRALTY INLET.				
Wilson Point, lighthouse	48 8 40	122 45 0	"	331
Whidbey Island, Admiralty Head ltho.	48 9 22	122 41 0		333
Point No Point, lighthouse	47 54 40	122 31 5	"	334
Duwamish Bay, lighthouse on W. point	47 39 45	122 23 30	"	335
Restoration Point	47 35 6	122 29 15	Vancouver, &c. U. S. Survey.	336
Tacoma, wharf	47 16 30	122 28 15		338
Steilacoom, Fort	47 10 45	122 34 15	"	339
Budd Inlet: Olympia, wharf.	47 3 0	122 55 0	"	343
Whidbey Island, Partridge Point	48 13 0	122 47 0	"	347
Lummi Island, North point	48 45 0	122 42 12	Captain G. H. Richards.	347
Semishmoo Bay, Parallel station	49 0 0	122 45 30		362
Lopez Island, Cape Colville, S. E. point.	48 25 35	122 48 50	"	370
San Juan Id., H. B. Co.'s post at S. end.	48 27 45	123 2 0	"	
VANCOUVER ISLAND.				
Port San Juan, Pinnacle Rock	48 33 30	124 27 37	Comm. Wood.	393
Sooke Inlet, Secretary Island	48 19 35	123 42 40		394
Race Island, lightho. on Great Race Rock.	48 17 45	123 32 15	D. Pender, R.N.	395
Esquimalt Harbour, Duntze Head	48 25 49	123 26 45	G. H. Richards.	397
Victoria Harbour, Laurel Point	48 25 22	123 23 2		399
Barclay Sound, Cape Beale lighthouse	48 47 30	125 12 50	"	407
Observatory Islet, Island Harbour	48 54 41	125 16 54	"	414
Obs. Id., Stamp Harb., Alberni Canal	49 13 46	124 50 7	"	411
Clayquot Sound, Obs. Id., Hecate Bay	49 15 22	125 56 17	"	421
Refuge Cove, village on West side	49 20 50	126 16 49	"	424
Hesquiat Harbour, boat cove	49 27 31	126 25 27	"	425
Estevan Point, South extreme	49 22 7	126 32 32	"	426
Nootka Sound, Friendly Cove, Obs. Islet	49 35 31	126 37 32	"	429
Nuchatlitz Inlet, Port Langford, Colwood Islet	49 47 20	126 57 5	"	433
Esperanza Inlet, rock, Queen's Cove	49 52 45	126 59 55	"	436
Kyuquot Sound, Shingle Point, at entrance of Narrowgut Creek	49 59 55	127 9 30	"	439
Nasparti Inlet, beach at head	50 11 21	127 37 58	"	442
Cape Cook or Woody Point, Solander Id.	50 6 31	127 57 20	"	443
Klaskino Inlet, Nob Point	50 17 15	127 52 0	"	445
Quatsino Sound, Obs. I., Koprino Harb.	50 30 0	127 52 16	"	449
Observatory Islet, North Harbour	50 29 25	128 3 39	"	448
BRITISH COLUMBIA.				
Point Roberts, Parallel station, W. side	49 0 0	123 5 26	"	458
Fraser River entrance, lighthouse	46 9 0	123 16 0		462
Garry Point	49 7 4	123 12 1	"	462
New Westminster, Military barracks	43 13 1	122 54 26	"	463
Burrard Inlet, Atkinson Point, lighthouse.	49 19 40	123 16 0	"	465
English Bay, Government reserve	49 16 18	123 12 0	"	465

	Lat. North.	Long. West.	Authorities.	Page
Nanaimo Harb., Entrance Island lightho.	49 12 50	123 48 45	G. H. Richards.	469
Dr. Benson's house	49 10 15	123 56 36	"	470
Nanose Harbour, Entrance Rock	49 15 43	124 8 6	"	474
Baynes Sound, Henry Bay, Beak Point	49 36 29	124 51 18	"	477
Cape Mudge	49 59 45	125 12 45	"	480
Howe Sound, Plumper Cove	49 24 39	123 29 20	"	483
Quathiaskey Cove, Valdes Island, S. point	50 2 42	125 14 38	"	495
Knox Bay, Thurlow Id., stream at head	50 24 15	125 39 0	"	498
Port Neville, Robber's Nob	50 31 9	126 4 21	"	499
Port Harvey, Tide-pole Islet	50 33 58	126 16 40	"	500
Alert Bay, Cormorant Id., Yellow Bluff	50 35 2	126 57 30	"	504
Beaver Harbour, Fort Rupert, Shell Islet	50 42 36	127 25 7	"	506
Port Alexander, Goletas Ch., islet in centre	50 50 49	127 39 57	"	508
Hope Island, Bull Harbour, N. point of Indian Island	50 54 47	127 56 3	"	509
Triangle Island, Scott Islands, W. point	50 51 53	129 6 32	"	513
Cape Scott, summit of cape	50 46 41	128 26 45	"	453
Cape Caution	51 8 0	127 48 0	D. Pender, R.N.	514
Virgin Rocks, largest	51 17 0	128 12 45	1867—1870.	515
Pearl Rocks, largest	51 22 30	128 1 30	"	515
Smith Sound, Egg Islet off entrance	51 15 0	127 51 0	"	515
Takush Harbour	51 16 51	127 38 43	"	517
Calvert Island, South point	51 25 0	127 55 0	"	518
Fitzhugh Sound, Schooner Retreat, Centre Island	51 28 10	127 44 38	"	519
Namu Harbour	51 51 44	127 52 23	"	520
Fitzhugh Sound, Pt. Walker	51 55 30	127 55 0	"	520
Burke Channel, Restoration Cove	52 0 40	127 40 30	"	521
Beltula anchorage	52 22 42	126 48 4	"	521
Fisher Canal, Port John, Mark Rock	52 7 20	127 52 30	"	522
Milbank Sound, Cape Swain	52 9 0	128 33 30	"	527
Port Blakeney	52 18 47	128 22 42	"	529
Finlayson Channel, Carter Bay	52 49 41	128 24 34	"	531
Muscel Canal, Poison Cove	52 55 0	128 1 0	"	532
Gardner Canal, Point Staniforth	53 35 30	128 47 0	"	533
Coghlan Anchorage	53 22 44	129 17 16	"	535
Grenville Channel, Klewnuggit Inlet, Morning Reef	53 39 24	129 44 51	"	536
Skeena River, Point Lambert	54 6 0	130 5 20	"	539
Canal de Principe, Port Stephens, Bluff Pt.	53 20 0	129 44 0	"	546
Chatham Sound, Metlah-Catlah Bay	54 20 10	130 27 30	"	551
Port Simpson, Obs. spot	54 33 51	130 26 36	"	554
Stephens Island, Qlawdzset, Harris Id.	54 12 59	130 45 40	"	558
Point Maskelyne, entr. of Works Canal	54 39 0	130 26 30	"	556
Portland Inlet, Kincolith Mission, Nasa B.	54 59 26	129 57 36	"	563
Observatory Inlet, Salmon Cove	55 15 34	129 52 30	"	564
Portland Canal, Bear River, at head	55 56 3	130 3 27	"	567
QUEEN CHARLOTTE ISLANDS.				
Cape St. James, South extreme	51 54 0	131 2 0	G. M. Dawson, &c.	571
Houston Stewart Channel, Forsyth Pt.	52 9 0	131 3 30	"	572
Cumshewa Inlet, Kingai Island	53 1 30	131 33 0	"	578
Skidgate Channel, Bar rock at E. entr.	53 22 30	131 51 0	D. Pender, R.N.	579
Cape Ball	53 43 0	131 56 0	G. M. Dawson, &c.	581
Rose Point	54 11 0	131 36 0	"	582
Virago Sound, Cape Edensaw-	54 4 30	132 21 30	"	584
Langara or North Island, North point	54 15 0	132 56 30	"	585
Hippa Island, West point	53 33 0	132 59 30	"	586
Skidgate Channel, Point Buck	53 12 0	132 34 0	"	586
Port Kuper, Sansum Id., in Mitchell Har.	52 56 31	132 9 40	G. Moore, R.N.	587
Cape Henry	52 55 30	132 22 0	Chart, &c.	588
Tasoo Harbour, entrance	52 41 0	132 7 30	"	588
Anthony Island, South point	52 5 30	131 12 0	"	588

Cape I
 Tonga
 Behm
 New
 Revilla
 Port St
 Cape C
 Duke of
 Point
 Cape
 Prince
 Point
 Point H
 Etoline
 Sukine
 Point H
 Port Prot
 Port Bea
 Point St.
 Cape Deci
 Cape Polo
 Cape Addi
 Cape San
 Raza Islan
 Cape Muzo
 San Carlos
 Christian S
 Point Ell
 Prince Fred
 Port Cam
 Admiralty I
 Point Nep
 Cape Fansha
 Stephens Pa
 Port Snett
 Point Retr
 Chatham Str
 Point Mar
 SITKA ARCHI
 Cape Omm
 Port Concl
 Graven Por
 Point Augu
 Lynn Cana
 Seduction I
 Point Adol
 Port Althor
 Cape Croa
 Portlock Ha
 Cape Edwar
 Klokachova
 Krusov Islan
 Sitka Sound
 Biorka Islan
 Cross Sound, P
 Cape Spencer
 Cape Fairweath
 Mount Fairwe
 Behring Bay, C
 Port Mulgr
 Digges Bay,
 Point Manby
 Point Rion

North

TABLE OF GEOGRAPHICAL POSITIONS.

xvii

	Lat. North.	Long. West.	Authorities.	Page
COAST OF ALASKA.				
Cape Fox	54 46 30	130 50 0	Vancouver, &c.	595
Tongus, U.S. post	54 47 0	130 44 0	"	595
Behm Canal, Point Sykes	55 6 0	131 5 0	"	596
New Eddystone Rock	55 29 0	130 53 0	"	596
Revilla-Gigedo Id., Cape Whaley, N. point	55 56 0	131 17 0	"	596
Port Stewart, Islet on S.W. side	55 38 15	131 45 0	"	597
Cape Chamano	55 29 0	131 45 0	"	597
Duke of Clarence Strait, C. Northumberland	54 52 0	131 14 30	"	598
Point Percy	54 55 40	131 26 0	"	599
Cape de Chacon	54 42 0	131 54 0	"	599
Prince Ernest Sound, Point le Mesurier	55 46 0	132 12 0	"	600
Point Warde	56 9 0	131 58 0	"	600
Point Highfield, Simonoff Island	56 33 0	132 22 0	"	601
Etoline Harbour, Wrangell, U.S. post	56 32 0	132 21 30	F.O. Simpson R.N.	601
Stikine River, Rothesay Point	56 40 30	132 20 0	Vancouver, &c.	601
Point Howe	56 33 0	132 48 0	"	601
Port Protection, Point Baker	56 21 0	133 33 0	"	602
Port Beauclerc, Islet off	56 15 0	133 46 0	"	603
Point St. Albans	56 7 30	133 51 0	"	604
Cape Decision	56 2 0	134 3 0	"	604
Cape Polo	55 58 0	133 45 0	"	605
Cape Addington	55 26 0	133 48 0	"	605
Cape San Bartolom	55 13 0	133 38 0	"	605
Rasa Island, or Wolf Rock	55 1 6	133 27 30	"	605
Cape Muzon	54 41 0	132 37 0	"	606
San Carlos, or Forrester Id., South point	54 48 0	133 30 0	"	606
Christian Sound, Port Malmesbury, S. pt.	56 16 0	134 9 0	"	606
Point Ellis	56 30 30	134 15 0	"	607
Prince Frederick Sound, Point Kingsmill	56 52 0	134 20 0	"	607
Port Camden, Point Macartney	57 1 30	133 57 0	"	607
Admiralty Island, Point Gardiner	57 0 30	134 28 30	"	607
Point Nepean	57 10 0	134 2 0	"	608
Cape Fanshaw	57 11 0	133 25 0	"	608
Stephens Passage, Port Houghton, N. pt.	57 19 30	133 24 0	"	608
Port Snettisham, North point	57 52 30	133 47 0	"	609
Point Retreat	58 23 0	135 0 0	"	610
Chatham Strait, Hood Bay, Point Samuel	57 32 0	134 38 0	"	612
Point Marsden	58 6 30	134 55 0	"	613
SITKA ARCHIPELAGO.				
Cape Ommaney, Wooden Island	56 10 0	134 32 0	"	619
Port Conclusion, South point	55 16 0	134 30 30	"	619
Graven Point	57 27 0	134 52 0	"	628
Point Augusta	58 4 0	134 59 0	"	620
Lynn Canal, Point Couverson	58 12 0	135 4 0	"	621
Seduction Point	59 2 0	135 12 0	"	615
Point Adolphus	58 18 0	135 40 0	"	622
Port Althorp, George Island, S.W. pt.	58 11 30	136 14 0	"	623
Cape Cross	57 57 0	136 28 0	"	625
Portlock Harbour, entrance	57 44 0	136 11 0	"	625
Cape Edward	57 37 30	136 8 0	"	625
Klokacheva Sound, Sionchi Point	57 17 30	135 45 0	Russian Chart.	626
Kruzov Island, Cape Edgumbe	57 0 15	135 46 30	"	628
Sitka Sound, Sitka	57 2 52	135 19 45	U. S. Chart.	632
Biorka Island, Entrance Island	56 52 45	135 28 0	"	634
Cross Sound, Point Wimbledon	58 19 0	136 14 0	Vancouver, &c.	623
Cape Spencer	58 13 0	136 27 0	"	624
Cape Fairweather	58 50 30	137 50 0	"	635
Mount Fairweather	58 54 30	137 31 0	"	635
Behring Bay, Cape Phipps	59 33 0	139 47 0	"	636
Port Mulgrave, Point Turner	59 32 30	139 43 0	Sir E. Belcher.	636
Digges Bay, Point Latouche	59 51 0	139 32 0	Vancouver, &c.	637
Point Manby	59 43 0	140 13 0	"	638
Point Riou	59 54 0	141 14 0	Sir E. Belcher.	638

North Pacific.

TABLE OF GEOGRAPHICAL POSITIONS.

	Lat. North.	Long. West.	Authorities.	Page
Mount St. Elias, 19,500 feet -	60 20 45	131 12 0	U. S. Survey.	639
Pamplona Rock -	59 3 0	142 15 0	Spanish Chart.	639
Cape Suckling -	60 1 0	143 54 0	U. S. Survey.	640
Cape Island, Cape Hamond -	59 47 0	144 28 0	"	641
Prince William Sound, Cape Withed -	60 29 0	145 47 30	"	643
Cape Hinchinbrook -	60 16 30	146 27 0	"	643
Port Etches, Phipps Point -	60 21 12	146 32 0	Sir E. Belcher, &c.	644
Port Gravina, S. E. point -	60 41 0	145 11 30	Vancouver, &c.	645
Snug Corner Bay -	60 45 0	146 35 0	"	645
Point Valdes, Port Freemantle -	60 57 0	146 49 0	"	645
Point Culross -	60 44 30	147 52 0	"	646
Montagu Island, South point -	59 46 0	147 40 0	"	647
Port Chalmers, Point Gilmour -	60 16 0	147 5 0	"	648
Cape Puget -	59 55 0	148 3 0	"	649
Chiswell Islands, South group -	59 31 0	149 2 0	"	649
Pie Islands, South extreme -	59 19 0	149 51 0	"	649
Point Gore -	59 11 0	150 22 0	"	649
Cook Inlet, Cape Elizabeth -	59 9 0	151 18 0	"	649
Port Chatham, watering-place -	59 14 0	151 20 0	"	649
Point Bede -	59 19 30	151 37 0	"	650
Tschougatschouk Bay, Anchor Point -	59 39 0	151 34 0	"	651
Ouchouganat Island, summit -	59 22 0	153 15 0	"	652
Cape Douglas -	58 52 0	153 3 0	"	652
Coulziack Island, S. point -	60 21 0	151 48 0	"	653
West Foreland -	60 42 0	151 25 0	"	653
North Foreland -	61 4 0	150 40 0	"	654
KODIAK ISLAND, Greville or Tolstoy Cape -	57 33 0	152 0 0	Chart.	656
St. Paul Harb., Chagavka Cove, W. pt. -	57 47 57	152 19 34	U. S. Survey.	656
Igatskoy Bay, Cape Tonkoy -	57 25 0	152 6 0	Lisiansky, &c.	659
Cape Trinity -	58 46 0	154 0 0	Vancouver, &c.	659
ALUTKIAN ISLANDS AND BEHRING SEA.				
Peninsula of Alaska, Ponalu Bay -	57 46 0	155 30 0	Wassiloff, &c.	660
Cape Providence -	57 0 0	156 27 0	"	665
Evdokoff Islands, S. island -	56 0 0	156 22 0	Golownin.	665
St. Stephen Island -	56 10 0	155 30 0	Krusenstern, &c.	665
Oukamok, or Tschirikoff Id., N. E. pt. -	55 56 0	155 30 0	Vancouver, &c.	665
Schumagin Ids., Ounga, N. E. point -	55 21 0	160 30 0	Chart.	666
Sandpoint, Popoff Strait -	55 19 17	160 31 14	W. H. Dall.	667
Sannak or Halibut Island, centre -	54 27 0	162 50 0	Sarytscheff.	668
Ounimak Island, Chichaldinskoi volcano -	54 45 0	163 59 0	"	670
Cape Mordvinoff -	54 51 0	164 29 0	"	670
Krenitzin Islands, Ougamok Island -	54 13 0	164 57 0	Kotzebue, &c.	671
Tigalga Island, centre -	54 5 0	165 5 0	"	671
Akoun Island, North point -	54 17 0	165 40 0	"	671
Ounalashka Island, S. W. point -	53 13 0	167 47 0	Lütke.	672
Ulakhka Bay, extremity of spit -	53 53 56	166 28 34	U. S. Survey.	673
Illuluk, church -	53 52 38	166 31 36	W. H. Dall.	673
Oumnak Island, Cape Sigak -	52 50 0	168 42 0	Kotzebue.	675
Joann Bogosloff Island -	53 56 20	167 33 0	Sarytscheff, &c.	675
Younaska Island, North point -	52 40 0	170 35 0	Kotzebue, &c.	676
Amoughta Island, centre -	52 26 0	171 14 0	"	676
Segouan Island, East point -	52 20 0	172 18 0	Tebenkoff.	677
Amlia Island, East Cape -	52 6 30	172 58 0	Lütke.	677
Atka Island, Korovinakaia Bay, S. cape -	52 12 50	174 34 0	Inghestrom, &c.	679
Sitkhin Island, centre -	52 4 30	176 10 0	Stanikowitch.	683
Adak Island, North end -	52 3 0	176 40 0	Inghestrom, &c.	680
Bay of Islands -	51 49 16	176 51 58	W. H. Dall.	680
Kanaga Island, N. E. point -	51 53 0	176 59 0	Inghestrom, &c.	681
Tanaga Island, N. W. peak -	51 55 0	178 17 0	Sarytscheff, &c.	681
Goreloy or Burnt Island, summit -	51 46 0	178 56 0	"	681
Amatignak Island, centre -	51 17 0	179 10 0	"	681
Semisopchnoi, or Seven Mountains Id. -	51 59 0	179 45 57	Long. E.	
Amchitka Island, N. W. point -	51 38 0	178 35 0	Inghestrom, &c.	681
Kirilovskaia Bay -	51 27 1	178 56 0	"	682
			"	682

Amch
Kryci
Kika
Kiak
Bouldy
Semita
Aguttoi
Atiou I

Izonhek
Amak of
Cape Ro
Moller I
Cape S
Cape Str
Cape Men
Ongatchi
Bristol I
River Na
Chramts
Nouchaga
Hagemoin
Cape New
Bay of Go
Kuskowim
Cape Avin
Nuniwak I
S. E. poin
Cape Vanc
Cape Roma
Yukon Riv
Cape Steph
Tebenkoff
Unalachloe
Cape Denbi
Cape Darby
Golownine I
Azink or Sh
Point Rodn
Port Claren
Oukivok, or
Cape York
CAPE PRINC
Americ
Diomedes Isl
Point Barro
St. Lawrence
N. E. Cape
St. Matthew
Cape Goro
Morjovi I
Prybilov Isl
St. Paul Is

Cape North
Cape Serdze
EAST CAPE of
St. Lawrence
Cape Pnaou
Motchigunsk

TABLE OF GEOGRAPHICAL POSITIONS.

xiv

	Lat. North.	Long.	Authorities.	Page
		Long. E.		
Amchitka Island, Constantine Harbour	51 23 33	179 12 12	W. H. Dall.	682
Kryci or Rat Island	51 45 0	178 10 0	Inghestrom, &c.	682
Ki-ka Island, North point	52 12 0	177 40 0	W. H. Dall	683
Ki-ka Harbour	51 58 59	177 29 46	Inghestrom, &c.	683
Bouldyr Island, centre	52 35 0	173 43 0	"	683
Semitsch Island, W. end	52 46 0	173 40 0	"	683
Agatou Island, North point	52 30 0	173 20 0	Etolme.	683
Attou Island, Tschitschagoff Bay	52 56 0	173 7 0	"	683
SEA OF BEHRING.				
		Long. W.		
Izenbok Bay, Cape Glazonap, or Mitkoff	55 14 8	162 50 7	Lütke.	685
Anak or Aunak Island, South extreme	55 25 0	163 1 30	Stankowitch.	685
Cape Roshnoff	55 58 0	161 0 0	"	685
Moller Bay, Kritakoi Island, E. point	56 0 7	160 41 0	"	686
Cape Sényavino	56 23 45	160 2 45	"	686
Cape Stroganoff	56 52 0	158 48 0	"	686
Cape Menchikoff	57 30 4	157 58 5	"	686
Ougatchik, or Soulima River, Cape Greig	57 43 0	157 47 2	"	686
Bristol Bay, Cape Tschitschagoff	58 17 0	157 25 0	"	687
River Nanok, Paougvigmut village	58 42 6	157 0 30	"	687
Chramtschenko Bay, Cape Constantino	58 29 0	158 45 0	Von Wrangel.	688
Nouchagak River, Fort Alexandroffsk	58 57 0	158 18 0	"	688
Hagemoister Island, Calm Point	58 35 0	160 50 0	Chramtschenko.	688
Cape Newenham	58 42 0	162 5 0	Cook, &c.	689
Bay of Good News, N. point of entrance	59 3 9	161 53 0	Etolino.	689
Kuskowine River, W. point	59 55 0	162 5 0	Chart.	689
Cape Avinoff	59 38 0	163 25 0	"	690
Nuniwak Island, N.E. extreme	60 27 0	166 10 0	"	690
S.E. point	60 0 0	165 22 0	Wassilioff.	690
Cape Vancouver	60 35 0	165 20 0	Etolme, &c.	690
Cape Romanzoff	61 51 32	166 13 0	"	690
Yukon River, Kwikhpak Mouth	62 40 0	163 55 0	Capt. E. E. Smith.	692
Cape Stephens	63 35 0	162 19 0	Cook.	692
Tobenkoff Cove, Redoubt St. Michael	63 28 30	162 3 0	U. S. Survey.	692
Unalachtlet, trading port	63 53 33	160 30 16	Zagoskin.	693
Cape Denbigh	64 19 0	161 30 0	Cook, 1778.	694
Cape Darby	64 16 0	162 44 0	"	694
Golovnine Bay, Stone Mole	64 26 42	162 59 0	Tobenkoff.	695
Aziak or Sledge Island	64 30 0	166 7 0	Cook.	695
Point Rodney, northern peak	64 42 10	166 17 50	Beechey.	695
Port Clarence, Point Spencer	65 16 40	166 47 50	"	696
Oukivok, or King Island	64 58 49	167 2 47	Cook.	695
Cape York	65 24 10	167 30 40	Beechey, &c.	697
CAPE PRINCE OF WALES (West Cape of America), bluff				
Diomed Islands, Fairway Rock, centre	65 36 30	168 3 10	"	697
Point Barrow	5 38 40	168 43 45	"	698
St. Lawrence Island, Schischmaroff Point	71 23 31	156 15 0	U. S. Survey.	700
N.E. Cape	63 52 0	171 30 0	Krusenstern, &c.	702
St. Matthew Island, Cape Upright	63 15 0	168 36 0	"	702
Cape Gore	60 18 0	172 4 0	Lütke, &c.	703
Morjovi Island, N. point	60 30 0	172 40 0	"	703
Prybilov Islands, St. George Id., village	60 34 0	172 4 0	"	704
St. Paul Island, Reef Point	56 39 16	169 19 0	U. S. Survey.	705
	57 8 0	170 12 0	"	706
COAST OF ASIA.				
Cape North	68 55 16	179 57 E.	Von Wrangel.	708
Cape Surdze Kamen	67 0 0	171 55 0	"	708
EAST CAPE of Asia	66 3 0	169 44 0	Beechey.	708
St. Lawrence Bay, Cape Krelougoun	65 29 40	170 50 0	Lütke.	709
Cape Pnaougoun	65 37 30	170 43 30	"	709
Metchignonsk Bay, entrance	65 30 30	172 0 0	"	711

	Lat. North.	Long.	Authorities.	Page
		Long. W.		
Cape Khalutkin - - -	65 15 0	172 0 0	Lütke.	711
Cape Nygtychyan - - -	65 5 0	171 55 0	"	711
Cape Neegtohan - - -	64 55 30	172 20 0	"	711
Arakamtchetchen Island, Cape Kyghynin -	64 46 0	172 1 0	"	713
Cape Mertens - - -	64 33 15	172 24 0	"	713
Ittygran Island, Cape Postels - - -	64 37 0	172 29 0	"	713
Cape Tchaplín - - -	64 24 30	172 14 0	"	714
Cape Tchoukotskoi - - -	64 16 0	173 10 0	"	714
Port Providence, Plover Bay - - -	64 21 55	173 23 54	Russian Survey.	716
Cape Spanberg - - -	64 42 30	174 36 0	Lütke.	717
Cape Attcheun - - -	64 48 0	175 28 0	"	717
Transfiguration Bay - - -	64 50 0	175 25 0	"	717
Cape Behring - - -	65 0 30	175 48 0	"	717
Gulf of St. Croix, Cape Meetchkon - - -	65 28 40	178 40 0	"	718
Mount Linlingai, 1,462 ft. - - -	65 36 30	178 5 0	"	718
		Long. E.		
Anadyr Bay, Aliumka Island - - -	64 37 0	177 40 0	Charts.	719
Cape St. Thaddeus - - -	62 42 0	179 38 0	Lütke.	719
Archangel Gabriel Bay, N. point of ontr. -	62 28 0	179 22 0	"	720
Cape Navarin, 2,512 feet - - -	62 16 0	179 4 30	"	720
Cape Olutorskoi - - -	59 58 0	170 21 0	"	720
Cape Govenskoi - - -	59 50 0	166 18 0	"	720
Cape Ilpinskoi - - -	59 48 30	164 57 0	"	720
Verkhoutoursky, or Little Karaghinsky Id. -	59 37 30	165 43 0	"	721
COMMANDER ISLANDS, Behring Island, Cape				
Khitróff - - -	54 56 0	166 46 0	"	721
Cape Youchin - - -	55 21 0	165 58 0	"	722
West extremity - - -	55 15 0	165 48 30	Chart.	722
Medny or Copper Island, settlement - - -	54 47 0	168 0 0	"	723
S.E. extremity - - -	54 39 0	168 9 0	Golownin, &c.	723
N.W. extremity - - -	54 54 0	167 32 30	"	723
KAMCHATKA, ETC.				
Karaghinsky Island, Cape Golenichtcheff -	59 13 30	164 40 0	Lütke.	725
Cape Krachenninikoff - - -	58 28 0	163 32 0	"	725
Cape Ilpinskoi - - -	59 48 30	164 57 0	"	726
Cape Kouzmichtcheff - - -	59 5 0	163 10 0	"	726
Karaghinskaja Bay, mouth of the Karaga -	59 8 0	162 59 0	"	726
South point - - -	58 55 0	163 2 0	"	726
Cape Oukinskoi - - -	57 58 0	162 47 0	"	726
Cape Ozernoi - - -	57 35 0	163 14 0	"	726
River Stolbovskaja - - -	56 40 30	162 39 0	"	727
Cape Stolbovoi - - -	56 40 30	163 21 0	"	727
Cape Kamchatskoi - - -	56 10 0	163 25 0	"	727
Klutchevskoi Volcano, 15,766 feet - - -	56 8 0	160 45 0	"	727
Cape Kronotskoi - - -	54 54 0	162 33 0	"	728
Kronotskoi Volcano, 10,610 feet - - -	54 45 0	160 37 0	"	728
Cape Shipunskoi - - -	53 6 0	160 5 0	"	728
Villeuchinsky Peak, 7,372 feet - - -	52 42 0	168 22 0	Chart.	731
Avatcha or Awatska Volcano, 11,500 ft. -	53 21 0	158 47 0	"	731
AVATCHA BAY, church of Petropaulovski -	53 1 0	158 39 15	Beechey, &c.	734
Cape Gavareah - - -	52 18 0	158 43 0	Chart.	735
Cape Lopatka - - -	50 52 30	156 45 0	"	735
KURILE ISLANDS.				
Alaid Island - - -	50 54 0	155 32 0	Krusenstern.	737
Sumshu Island, centro - - -	50 46 0	156 26 0	"	737
Poromushir Island, high mountain - - -	50 15 0	155 24 15	"	737
N.E. point - - -	50 48 0	156 7 30	"	737
Shirinsky Island - - -	50 15 0	154 58 0	"	737
Monkonrushy Island, centro - - -	49 51 0	154 32 0	"	738

TABLE OF GEOGRAPHICAL POSITIONS.

xxi

	Lat. North.	Long. East.	Authorities.	Page
Avos Rock -	49 49 0	154 19 0	Krusenstern.	738
Onnekotan Island, Cape Krenitzin -	49 19 0	154 44 0	"	738
Kharimkotan Island, centre peak -	49 8 0	154 39 0	"	738
Shishkotan Island, centre -	48 52 0	154 8 0	"	738
Chirinkotan Island -	49 1 0	153 30 0	part.	738
Musir Islands, or The Snares -	48 36 0	153 44 0	"	738
Raikoke Island, peak -	48 17 0	153 15 0	"	738
Mataua Island, Sarytsheff Peak -	48 6 0	153 11 0	"	738
Rashau Island -	47 51 3	152 48 0	"	738
Ushishir Island, South point -	47 35 0	152 37 0	"	739
Ketoy Island, South extremity -	47 19 0	152 22 0	"	739
Simusir Island, Provost Peak -	47 6 0	151 52 50	"	739
The Four Brothers, South Torpoy Island -	46 29 15	150 3 30	Golownin.	739
Broughton Island -	46 42 30	150 28 30	"	739
Urup, Cape Castricum, North point -	46 18 0	150 28 0	Chart.	740
Cape Van der Lind, South point -	45 37 0	149 34 0	"	740
Iturup Island, N.E. point -	45 36 0	148 49 6	"	740
Cape Rikord, South point -	44 26 0	146 58 0	"	741
Skotan or Spanberg Island, centre -	43 50 0	146 49 0	"	742
Kunashir Island, St. Anthony's peak -	44 22 0	146 16 0	"	742
Establishment in Traitor's Bay -	43 44 0	145 33 0	"	742
SEA OF OKHOTSK.				
Cape Lopatka -	50 52 30	156 45 0	Chart.	743
Bolcheretsk -	52 54 30	156 47 30	King, &c.	743
Tigel River, entrance -	58 1 0	158 18 30	Charts.	744
Cape Utkolokski -	57 50 0	157 18 0	"	744
Cape Bligan -	58 40 0	151 35 0	"	744
Poustaresk -	61 0 0	162 30 0	Lesseps.	744
Kaminoi, at the mouth of Penjina River -	62 0 0	162 50 0	"	744
Ghijoga, or Fort Jieigjinsk -	62 10 0	160 15 0	Chart.	745
Cape Piegbin -	59 10 0	156 13 0	"	745
Okhotsk -	59 20 0	143 14 0	"	745
Port Alan, Cape Vneshni -	56 25 28	138 21 0	"	746
Jonas Island, 1,200 feet -	56 23 0	143 16 0	Krusenstern.	747
Fort Oudskoi -	54 29 0	134 58 0	Kosmin.	748
Great Shantar Island, North point -	55 11 0	137 40 0	"	747
Prokofieff Island -	55 5 0	138 22 0	"	748
Konssoff Island -	54 43 0	138 12 0	"	748
Cape Dougandsha -	54 40 0	136 52 0	Chart.	748
River Tagur, mouth -	53 40 0	136 46 0	"	748
Cape Lütke -	53 57 30	140 22 0	"	748
SAGHALIN ISLAND, ETC.				
Cape Elizabeth -	54 24 30	142 47 0	Krusenstern.	750
Cape Mary -	54 17 30	142 17 45	"	750
North Bay, Tartar colony -	54 15 45	142 37 0	"	750
Nadijeda Bay, Cape Horner -	54 10 15	142 27 34	"	750
Cape Golovatcheff -	53 25 0	141 55 0	"	751
Cape Löwenstern -	54 3 15	143 15 0	"	751
Cape Klokatcheff -	53 46 0	143 7 0	"	751
Cape Wurst -	53 0 0	143 30 0	Chart.	751
Shoal Point -	52 34 0	143 27 0	"	751
Downs Point -	51 53 0	143 20 0	"	751
Cape Delisle -	51 0 30	143 43 0	"	751
Cape Ratmanoff -	50 48 0	143 55 0	"	751
Cape Rimnik -	50 12 30	144 5 0	"	751
Mount Tiara -	50 3 0	143 35 0	"	751
Cape Bellingshausen -	49 35 0	144 25 45	Krusenstern.	751
Cape Patience -	48 52 0	144 46 15	"	752
Robben Island, N.E. point -	48 36 0	144 33 0	"	752
River Neva, mouth -	49 14 40	143 10 0	"	752
Cape Notetu or Seimonoff -	48 53 20	143 2 0	"	752

	Lat. North.	Long. East.	Authorities.	Page
Cape Dalrymple - - -	48 21 0	142 44 0	Krusenstern.	752
Cape Mulofsky - - -	47 57 45	142 34 0	"	752
Barnizet Peak, or Mount Spanberg - -	47 33 0	142 20 0	"	752
Cape Senniavine - - -	47 16 30	142 59 30	"	752
Cape Tonin - - -	46 50 0	143 27 30	"	753
Cape Löwenorn - - -	46 23 10	143 38 0	"	753
Cape Siretoko or Aniwa - - -	46 2 20	143 25 0	"	753
Cape Nojoro or Cuillon, lighthouse -	45 54 0	142 2 0	Chart.	753
La Dangereuse Rock, or Kamon Opasnosti-	45 48 15	142 10 0	Ward, 1855.	754
Karsakovsk - - -	46 38 47	142 47 43	Russian Chart.	754
Tobootchi Bay, Klykoff Point - - -	46 29 3	143 18 18	"	754
Risiri, Pic de Langle - - -	45 11 0	141 12 15	Krusenstern.	755
Rofunsiri, Cape Hieber - - -	45 29 0	140 55 0	Chart.	755
Cape Nossyab - - -	45 27 30	141 35 0	"	756
GULF OF TARTARY, ETC.				
Maucka Cove - - -	47 3 0	142 5 0	"	758
Kosounai - - -	47 58 45	142 11 30	"	759
Sertunai - - -	49 30 0	142 7 0	"	759
Dui, lighthouse - - -	50 50 0	142 6 35	"	760
Cape Pogobi - - -	52 12 30	141 38 0	"	761
Cape Disappointment - - -	45 48 0	137 51 0	"	761
Cape Suffren - - -	47 19 0	139 5 0	"	761
Fish River - - -	47 59 0	139 31 0	"	761
Low Cape - - -	48 28 0	140 12 0	"	761
Beachy Head, or St. Nicholas Point -	48 58 0	140 24 0	"	761
Barracouta Harbour, Tullo Island -	49 1 50	140 19 0	"	761
Castries Bay, Quoin Point, lighthouse -	51 26 0	140 54 0	"	763
Alexandrovasi - - -	51 28 2	140 48 43	Russian Chart, &c.	763
Nikolaevsk - - -	53 8 0	140 45 0	"	766
Expedition Bay, Musoir Rock - - -	42 37 50	130 48 45	"	768
Amur Bay, or Guérin Gulf, Pestchanni Pt.	43 11 0	131 48 0	"	769
Skrypleff Island, lighthouse - - -	43 1 45	131 57 45	"	771
Vladivostok, Observation spot - - -	43 6 51	131 52 44	"	771
Askold Island, lighthouse - - -	42 43 35	132 21 10	"	772
Hornet Bay, Fox Island - - -	42 45 0	132 56 0	"	773
Islet Point, or Cape Zamok - - -	42 48 0	133 42 0	"	773
Siau-Wuhu Bay, Observation spot at head -	42 54 14	133 50 32	Ward, 1859.	773
Olga Bay, or Port Michael Seymour, Bry-	-	-	-	-
done Island - - -	43 41 15	135 13 19	"	774
St. Vladimir Bay, Low Point - - -	43 53 40	135 27 21	"	775
Shelter Bay - - -	44 28 0	135 59 0	Trouson, 1856.	776
Sybble Bay, South point - - -	44 13 45	136 22 30	"	776
Pique Bay - - -	44 46 15	136 27 15	"	776
Bullock Bay - - -	45 5 0	136 44 0	"	776
Luké Point - - -	45 24 0	137 16 0	Chart.	776
JAPANESE ARCHIPELAGO.				
KIUSIU AND SIKOK.				
Sateno misaki, Cape Chichakoff, lighthouse	30 58 30	130 40 0	Charts.	784
Kagosima, N. side of river entrance -	31 31 3	130 30 11	"	785
Oo sima, lighthouse - - -	31 31 0	131 25 0	"	786
Nomi Harbour - - -	33 23 0	133 20 0	"	787
Wurato or Kotsi Inlet, lightho. on S. point	33 30 0	133 36 0	"	787
SETO UCHI, OR INLAND SEA.				
Kosime no oosima, N.E. point - - -	33 55 0	130 26 30	"	789
Simonosaki, Rokuren Island, lighthouse -	33 58 53	130 52 31	"	790
Moze saki - - -	33 58 15	130 56 50	"	793

Siwo
Hime
Taur
Ozum
Tomo
Naba
Awad
Hiogo
Osaka
Isumi
Hino
Tanabe

Siwo m
Oo sima
Light
Ura-kan
Matoya
Suga sir
Omair sa
Fusi-ya
Suruga
Tago
GULF of
Iro-o s
Mikom
Simoda
Joka si
Nosima
Sagami
Kuwan
Yokos
Yokoh
Haneda

Vol

Oo sima o
Kosu sima
Miaki sim
Mikura Is
Redfield Is
Broughton
Fatsio Is
Acpa sima
Bayonnaie
Smith Is
Ponafidin
Lot's Wife

EA

Inu-bo-ye
Kingkas
Yamada H
Tugar Str
Oho saki
Tatsup
Torwi s
Awomor
Cape Ye

TABLE OF GEOGRAPHICAL POSITIONS.

xxiii

	Lat. North.	Long. East.	Authorities.	Page
Simonosaki, I saki, lighthouse	33 57 43	131 1 52	Chart.	792
Hime sima, East end	33 44 0	131 42 20	"	795
Tsuru sima, lighthouse	33 53 35	132 38 15	"	796
Ozumi no hana, or Cape Iyo	34 8 30	132 56 20	"	797
Tomo	34 22 30	133 23 30	"	797
Nabae sima, lighthouse	34 23 5	133 49 10	"	800
Awadji Island, North point, light	34 37 0	134 59 40	"	804
Hiogo, Kobé, East pier	34 41 18	135 10 57	"	807
Oosaka, Temposan Fort, lighthouse	34 39 45	135 26 0	"	806
Isumi Strait, Tomangai sima, lighthouse	34 16 50	135 0 40	"	809
Hino misaki, extreme	33 52 40	135 4 15	"	813
Tanabé Bay, Cape Tanabé	33 40 0	135 20 45	"	813
S.E. COAST OF NIPON.				
Siwo misaki, lighthouse	33 26 20	135 45 40	"	814
Oo sima, Harbour of Kii, Pisayama Rock	33 29 8	135 48 15	"	815
Ura-kami Harbour, South point	33 28 15	135 52 10	"	816
Matoya Harbour, lighthouse	33 33 45	135 55 30	"	817
Suga sima, lighthouse	34 21 55	136 54 44	"	820
Omai saki, lighthouse	34 30 40	136 54 50	"	820
Fusi-yama Mountain	34 35 46	138 13 28	"	823
Suruga Gulf, Shimidau Harbour, Mia saki.	35 21 0	138 44 30	"	824
Tago Bay	35 0 51	138 31 30	"	824
GULF OF YEDO.	34 48 12	138 46 22	"	825
Iro-o saki or Cape Idsu, lighthouse	34 36 2	138 51 12	"	825
Mikomoto or Rock Island, lighthouse	34 34 25	138 56 57	"	826
Simoda Harbour, Centre Island	34 40 0	138 56 40	"	827
Joka sima, lighthouse	35 8 8	139 37 7	"	831
Nosima saki, lighthouse	34 53 20	139 53 57	"	831
Sagami misaki, lighthouse	35 8 27	139 41 8	"	833
Kuwan-on saki, lighthouse	35 15 18	139 45 12	"	834
Yokosaka Harbour, Eyi yama Point	35 17 20	139 38 50	"	834
YOKOHAMA, Victualling stores	35 26 23	139 39 13	"	837
Haneda Point, lighthouse	35 31 56	139 48 3	"	838
VOLCANIC ISLETS, S.E. OF JAPAN.				
Oo sima or Vries Island, S.E. point	34 40 0	139 25 45	"	842
Kosu sima, highest part	34 12 15	139 9 15	"	843
Miaki sima, highest part	34 5 0	139 31 30	"	844
Mikura Island, highest part	33 52 0	139 35 0	"	844
Redfield Rocks, southern	33 56 0	138 48 15	"	843
Broughton Rock, centre	33 39 0	139 17 45	"	844
Fatsio Island, bay at S.E. end	33 4 24	139 50 21	"	844
Acra sima	32 28 30	139 43 45	"	845
Bayonnaise Rocks	31 55 15	139 54 18	Huntington,	845
Smith Island	31 27 8	140 2 0	"	845
Ponafidin Island	30 28 26	140 14 12	"	846
Lot's Wife, or Rica de Oro	29 46 28	140 19 45	"	847
EAST COAST OF NIPON, ETC.				
Inu-bo-ye saki, lighthouse	35 43 30	140 51 32	Chart.	849
Kingkasan Island, lighthouse	38 16 57	141 36 0	"	851
Yanada Harbour, Ko sima	39 27 17	141 59 0	"	852
Taugar Strait, Siriya saki, lighthouse	41 26 10	141 29 25	"	853
Oho saki, or Cape Greig	41 9 0	140 15 30	"	855
Tatsupi saki, North point	41 17 0	140 21 0	"	855
Toriwi saki, centre of low island off	41 33 0	140 55 0	"	856
Awomori, light	40 51 45	140 45 15	"	857
Cape Yesan	41 48 30	141 11 0	"	857

TABLE OF GEOGRAPHICAL POSITIONS.

	Lat. North.	Long. East.	Authorities.	Page
Tsugar Strait, Hakodate Harbour, Kamida	" " "	" " "		
Creek, entrance -	41 47 8	140 43 44	Chart.	868
Consular garden -	41 46 0	140 42 37	"	868
Cape Sirakami -	41 24 30	140 12 0	"	861
ISLAND OF Yezo.				
Volcano Bay, Endermo Hr., Sinnororan -	42 19 54	140 59 33	"	864
Cape Yerimo -	41 56 0	143 15 0	"	865
Akishi Bay, entrance to lagoon -	43 2 22	144 51 50	"	865
Cape Noyshaf, lighthouse -	43 26 47	145 52 0	"	866
Nemoro, lighthouse on Eenten sima -	43 20 30	145 32 0	"	867
Cape Sirotoko or Spanberg -	44 20 0	145 24 0	"	867
Cape Soya, lighthouse -	45 31 0	141 54 30	"	756
Matsumai, river entrance -	41 26 30	140 9 30	"	861
Okusiri Island, North point -	42 15 30	139 34 0	"	869
Sutt Bay, Otatsuts -	42 47 30	140 21 0	"	869
Cape Novosilzov -	43 20 0	140 22 0	"	870
Iskarri Bay, Cape Skudutza, lighthouse -	43 14 0	140 54 0	"	870
Cape Tomomai -	44 20 0	141 40 0	"	871
Taruri Island, North end -	44 28 0	141 17 0	"	871
Cape Nossyab -	45 27 30	141 36 0	"	871
WEST COAST OF NIPON.				
Bittern Rocks, S.W. rock -	40 31 0	139 31 0	Richards, 1855.	872
Tabu sima, Observatory Rock, off E. extr. -	39 11 53	139 34 17	Ward, 1859.	872
Awa sima, N.E. extreme -	38 29 36	139 16 7	"	872
Sado Island, Ya or Wa saki -	38 19 55	138 30 30	Chart.	873
Ogi Bay -	37 49 15	138 26 25	"	873
Niegate, lighthouse -	37 56 26	139 3 56	"	873
Toyama Bay, Fushiki, lighthouse -	36 47 47	137 3 42	"	875
Nanao, North Harbour, Nisaki-bana -	37 11 55	136 55 58	Bullock.	875
Rokko saki, lighthouse -	37 30 0	137 19 0	Chart.	876
Nana sima or Astrolabe Rock -	37 35 0	136 54 0	"	877
Yutsi sima -	37 50 30	136 55 0	"	877
Mikuni Roads -	36 12 0	136 8 0	Gouldsborough.	877
Tsuruga Bay, lighthouse at entrance -	35 47 30	135 58 0	Chart.	878
Miyadeu, East side of river entrance -	35 32 9	135 12 41	Kimotsuki.	878
Oki Islands, Saigo Harbour -	36 11 58	133 19 20	Chart.	879
Mino sima, centre -	34 45 30	131 7 0	"	879
Taka yama, or Cape Louisa -	34 38 30	131 36 0	"	879
Ai sima, or Richards Island -	34 30 30	131 17 0	"	880
Aburakani Harbour, Kudzu ura -	34 24 36	130 58 42	"	880
Tsu-no sima, lighthouse -	34 21 30	130 50 0	"	880
KIUSIU.				
Kotsu sima, centre -	34 15 0	130 6 30	"	881
Oro no sima, or Obree Island -	33 52 0	130 1 30	"	881
Kuri no kami, or Swain Reef -	33 48 0	130 16 45	"	882
Yebosi sima or Cone Islet, lighthouse -	33 41 30	129 58 50	"	882
Hakosaki Bay, Fakuoka, lighthouse -	33 35 45	130 23 45	"	883
Iki sima, Go no ura, Hara sima -	33 43 30	129 38 40	"	883
Yobuko Harbour, Taka sima, lighthouse -	33 33 38	129 54 0	"	884
Observation spot -	33 32 30	129 52 55	"	884
Hirado sima, Port Firando, Hirago sima -	33 23 5	129 32 5	"	887
Tas'ke lighthouse -	33 23 31	129 33 33	"	888
Yenoi sima, S.E. point -	33 0 20	129 21 40	"	889
Fuku she Rock, beacon -	33 4 45	129 26 30	"	890
Goto Islands, Uku sima, East point -	33 16 25	129 9 30	"	891
Hardy Harbour, Mia sima, N. point -	32 48 30	128 55 52	"	894
Fukai, camber -	32 41 40	128 50 50	"	895
Ose saki, lighthouse -	32 36 45	128 36 6	"	896

TABLE OF GEOGRAPHICAL POSITIONS.

XXV

	Lat. North.	Long. East.	Authorities.	Page
Tori sima or Pallas Rocks, S. rock	32 14 36	128 6 18	Chart.	897
Mo or Moac sima, Asses Ears	32 1 30	128 32 35	"	898
NAGASAKI, Iwo sima, lighthouse	32 43 0	129 45 13	"	899
Minage Point	32 44 28	129 51 13	"	903
Kaba sima, South point	32 33 10	129 46 0	"	906
Simabara, lighthouse	32 46 0	130 25 30	"	907
Amakusa, Sagitsu no ura, Oonska saki	32 17 42	130 2 26	"	908
Me saki	31 15 0	130 12 45	"	910
Koshiki Islands, Tatsu maru, N. point	31 50 20	129 50 0	"	911
Taka sima, or Symplegades, S. rock	31 26 45	129 44 0	"	912
Taukara se, or Retribution Rocks	31 18 30	129 44 20	"	912
Udsi sima, South end	31 10 30	129 25 30	"	912
SEA OF JAPAN.				
Liancourt Rocks				
Matsu sima, or Dagelet Island, peak	37 14 0	131 55 0	Forsyth.	915
Waywoda Rock	37 30 0	130 53 0	Chart.	915
Tsu sima Sound, Observatory Rock	42 14 30	137 17 0	"	915
	34 18 55	129 12 30	"	915

THE ISLANDS

	Discoverer.	Lat.	Long.	Authorities.	Page
ISLANDS BETWEEN THE EQUATOR AND LAT. 10° NORTH.					
		Lat. N.	Long. W.		
Malpelo Island -		4 3 0	81 36 0	Aldham.	923
Rivadeneira Shoal -	Rivadeneira, 1842	4 15 0	85 10 0	Rivadeneira.	923
Cocos Island, Chatham Bay Obs.		5 32 57	87 2 10	Sir E. Belcher.	925
Walker Islands -	Walker, 1814	3 34 0	149 15 0	Walker.	926
Christmas Island, Cook Islet -	Cook, 1777.	1 57 17	157 27 46	Skerrett.	927
Fanning Id., English Harbour, flagstaff -	Fanning, 1798	3 51 26	159 22 0	Richards.	929
Washington Island -	"	4 41 35	160 15 37	Wilkes.	930
Palmyra Island, Palm Point -	Sawle, 1802	5 49 4	162 11 29	Skerrett.	930
Samarang Isles, West Islet -	Scott, 1840	4 55 9	162 22 20	Scott.	931
Kingman Reef -	Kingman	6 27 30	162 21 0	mean.	932
Baker Island, centre -	Foster	0 13 30	176 29 30	Meade.	932
Howland or Holland Island -	Belcher, 1842	0 49 0	176 40 0	"	934
GILBERT ARCHIPELAGO.					
		Lat. S.	Long. E.		
Arurui, or Hurd Island, S. pt. -	The <i>Elizabeth</i> , 1810	2 40 54	176 54 30	Dutailles.	939
Nukunau or Byron Id., S. pt. -	Byron, 1765	1 23 42	176 31 0	Chart.	940
Peru or Francis Id., S. point -	Clerk, 1827	1 27 30	175 59 0	"	940
Onoatua or Clerk Id., Teumaha-	"	1 53 0	175 30 0	"	941
Tamana Island, South end -	"	2 33 45	175 55 0	"	941
Taputooea, Bishop, or Drum-					
mond Island, Utiroa -	Bishop, 1789	1 12 30	174 43 30	"	941
Nanouti or Sydenham Island, South extremity -	"	0 48 30	174 27 30	"	943
Aranuka or Henderson Id., South point -	Marshall, 1788	0 8 0	173 37 15	"	944
Kuria or Woodlee Id., N. end -	"	0 16 0	173 23 30	"	945
Apamama Id., S. pass, Sand Kay	"	0 20 54	173 51 14	Moore, 1881.	945
Maiana or Hall Id., S. end -	The <i>Elizabeth</i> , 1809?	0 51 30	173 0 30	Chart.	946
Tarawa or Knoy Id., S.W. extr.	Marshall, 1788	1 20 30	172 56 0	"	947
Maraki or Matthew Id., N. pt. -	"	2 1 30	173 20 0	"	948
Apaiang or Charlotte Island, Bingham Pass, re -	"	1 44 30	172 58 0	"	948
Taritari or Touching Island, S.E. point -	"	3 3 30	172 52 0	"	949
Makin or Pitt Id., N.E. point -	"	3 19 15	172 57 45	"	949
MARSHALL ARCHIPELAGO.					
Mili or Mulgrave Id., Barr Id.	Marshall, 1788	6 14 0	171 46 0	Bérard.	953
Majuro or Arrowsmith Islands, Jerid Island -	"	7 4 0	171 24 30	Chramtschenko.	955
Arhno, Daniel, or Pedder Id., S.E. point -	"	6 54 2	171 44 10	Meade.	955
N.W. point -	"	7 18 47	171 38 38	"	956
Aur or Ibbetson Islands, anch.	"	8 18 42	171 12 0	Kotzebue.	957
Maloclab or Calvert Islands, Kaven Island -	"	8 51 0	170 49	Chart.	957
Erikub or Bishop Junction Id., South point -	"	8 56 0	170 6 0	"	958
Wotje or Romanzoff Islands, Christmas Harbour -	Marshall, 1788	9 28 9	170 17 0	Kotzebue	958

Likiep
 S.E.
 Jemo
 Mejit
 Ailuk
 Ailuk
 Taka
 Utirik
 Bikar
 Rongelap
 Island
 Rongerik
 Islands
 Bikini, of
 Ailinginae
 Wotho
 Ujae or C
 Lae or Br
 Menschikov
 Lib Island
 Namuor M
 Oia or El
 Jabvat Isl
 Jalut or Bo
 Island, N
 Kili or Hun
 Namorik or
 Ebon, Boston
 Ebon Island
 Eniwetok
 Parry Island
 Ujilong or
 Uyeland, N

THE CAROLINE ISLANDS.
 Kusaie, Ualan
 Coquille F
 Port Lelé, I
 Mackaw Reef
 Pingelap or M
 Tugulu or
 Mokil or Duper
 South point
 Ponapi or Séri
 Kiti Harb.
 Metalanien H
 Ant or Andom
 Island
 Pakin Group,
 West point
 Ngatik or Val
 East extrem
 Nukuor or Mont
 East point
 Matador Island
 Greenwich or Co
 Orakul or Borden
 Dunkin Reef (P)
 Loap Island
 D'Urville Island

TABLE OF GEOGRAPHICAL POSITIONS.

xxvii

	Discoverer.	Lat. North.	Long. East.	Authorities.	Page
Likiep or Count Heiden Islands, S.E. end	-	" " "	" " "	-	-
Jemo or Steep-to Island	Kotzebue, 1817	9 48 0	169 21 0	Chart.	969
Mojit or New Year Island	Bishop	10 6 0	169 42 0	"	959
Ailuk or Tindal and Watts Id.,	Kotzebue, 1817	10 17 30	170 53 0	"	960
Ailuk Island	-	-	-	-	-
Taka or Souworoff Ids., S. end	Marshall, 1788	10 12 30	170 4 0	"	960
Utirik Island	-	11 2 0	169 47 0	"	960
Bikar or Dawson Ids., S. id.	"	11 14 30	169 57 0	"	960
Rongelab, Bigini, or Pescadore Islands, Enyvertok Island	"	12 14 0	170 15 0	"	960
Rongerik or Rimski-Korsakoff Islands, Rongelappellap	Wallis, 1767 ?	11 16 0	167 43 0	"	961
Bikini, or Eschscholtz Islands	Kotzebue, 1817	11 14 30	166 59 0	"	962
Ailinginae, Knox Island	" 1825	11 40 0	166 24 25	"	962
Wotho or Shinz Island	-	11 5 0	166 35 0	Kotzebue.	963
Ujae or Catherine Ids., Ujae I.	Shanz, 1835	10 11 0	166 6 0	Chart.	963
Lae or Brown Ids., Lae Id.	The Ocean, 1804	8 48 0	166 8 0	"	963
Menschikoff Ids., Kwajalein Id.	Brown, 1838	8 57 0	166 27 0	"	964
Lib Island, centre	The Ocean, 1804	8 41 0	167 46 30	"	964
Namuor Musquillo Ids., Bock I.	Dennet (?)	8 19 0	167 28 0	"	964
Olia or Elmore Islands, Airek-	Bond, 1792	7 59 0	168 11 0	"	965
Jabwat Island	The Elizabeth	7 12 30	168 53 0	"	966
Jaluit or Bonham Islands, Jabor Island, N.E. point	Dennet (?)	7 43 0	169 4 30	"	966
Kili or Hunter Island	-	-	-	-	966
Namorik or Baring Ids., S.W. pt.	The Elizabeth	5 55 29	169 39 19	Moore, 1884.	967
Ebon, Boston or Covell Islands,	Dennet	5 42 0	169 9 0	Chart.	967
Ebon Island, S.W. end	Bond, 1792	5 35 0	168 6 0	"	968
Eniwetok or Brown Group,	Ray, 1824	4 35 25	168 42 10	Tanner.	968
Purry Island	-	-	-	-	-
Ujilong or Arrecifos Islands,	Butler, 1794	11 21 0	162 25 0	Chart.	969
Uyelang, N.E. end	Providence, 1811	9 43 0	161 19 0	"	969
THE CAROLINE ARCHI- PELAGO, ETC.					
Kusaie, Ualan, or Strong's Id., Coquille Harbour	-	-	-	-	-
Port Lolé, Lolé Island	Crozer, 1804	5 21 20	163 5 0	Duperrey.	977
Mackaw Reef	-	5 20 0	163 9 0	Chart.	977
Pingelap or Mac-Askill Islands,	Mackaw, 1856	3 20 0	160 18 0	Mackaw.	977
Tugulu or North Island	Musgrave, 1793 (?)	6 14 30	160 52 0	Duperrey.	978
Mokil or Duperrey Isles, Mokil, South point	Duperrey, 1824	6 39 0	159 53 0	"	978
Ponapi or Saniavine Ids., Rono Kiti Harb., Namaur Id.	Lütke, 1828	6 47 0	158 8 0	Roynolds.	983
Metalanien Hr., Taucha Id.	-	6 51 0	158 18 0	Bridge.	985
Ant or Andema Group, South island	-	-	-	-	-
Pakin Group, Kaponoar Id., West point	"	6 44 0	157 53 30	Chart.	986
Ngatik or Valientes Islands, East extreme	"	7 4 40	157 44 0	Lütke.	987
Nukuor or Monteverde Islands, East point	Tompson, 1733	5 47 0	157 32 0	"	987
Matador Island	Montoverde, 1806	3 51 0	155 0 54	D'Urville.	988
Greenwich or Constantin Id.	Greenwich, 1825	1 30 0	157 0 0	Montravel.	988
Oruluk or Bordelaise Island	Saliz, 1826	1 4 0	154 45 0	Chart.	989
Dunkin Reef (?)	Dunkin, 1824	7 38 0	155 9 9	Dunkin.	989
Losap Island	Duperrey, 1824	8 50 0	154 10 0	Duperrey.	990
D'Urville Island	"	6 53 0	152 42 20	Chart.	990
		6 59 0	152 33 0		991

	Discoverer.	Lat.	Long. East.	Authorities.	Page
		Lat. N.			
Mortlock Isles, Port Chamisso, Lukuor Island -	Mortlock, 1793	5 20 18	153 58 0	Lütke.	992
Sotoan, Ta Island, W. end -	"	5 17 0	153 46 0	Chart.	993
Namoluk Group, Amesse Id. -	Lütke	5 45 15	153 16 30	Lütke.	993
Truk or Hogoleu Ids., Pise Id. -	Duperrey, 1824	7 42 30	151 46 0	Duperrey.	994
South Island -	"	6 57 0	151 57 30	Chart.	994
Tais Island, N.W. point -	"	7 18 30	151 48 30	D'Urville.	994
Hall Islands, Mourileu Island -	Hall	8 41 0	152 25 0	Chart.	996
Lütke or East Faiu Island -	Lütke	8 33 20	151 26 0	Lütke.	996
Namounito Group, Piserarr Id. -	Ibargoitia, 1801	8 34 20	152 32 30	"	997
Tamatam or Los Martires, E. id. -	Duperrey, 1824	7 27 30	149 28 0	Knorr.	997
Poloat or Enderby Islands, Alet Island -	Renneck, 1826	7 19 25	149 15 0	Freycinot	998
Suk or Ibargoitia Island -	Ibargoitia, 1799	6 40 0	148 23 0	Chart.	999
Pikelot or Coquille Islet -	Duperrey, 1824	8 9 0	147 42 0	Lütke.	999
West Faiu Islet -	Torres	8 3 0	146 50 0	Chart.	999
Satawal or Tucker Island -	Wilson, 1793	7 22 0	147 6 0	Duperrey.	1000
Lamotrek or Swede Ids., S. id. -	"	7 27 0	146 30 0	Lütke.	1000
Elato Island -	"	7 30 0	146 19 0	"	1000
Olimarao Isles -	Lütke, 1828	7 43 30	145 56 45	"	1000
Ifalik or Wilson Ids., S.E. pt. -	Wilson, 1793	7 14 0	144 31 0	"	1001
Wolea Group, N. extremity -	"	7 22 6	143 57 53	"	1001
Raour Island, N. extreme -	"	7 21 39	143 57 30	"	1002
Foraulep Island -	Lütke, 1828	8 36 0	144 36 0	"	1003
Eauripik or Kuma Islands -	Hunter, 1791	6 40 0	143 10 0	"	1003
Sorol or Philip Islands, E. id. -	"	8 6 0	140 3 0	"	1004
Fais or Tromelin Island -	Tromelin, 1828	9 46 0	140 35 0	"	1004
Ulithi or Mackenzie Ids., Egoi, East extreme -	"	10 7 53	139 54 58	Wilkes.	1004
Mogmog Island -	"	10 6 0	139 45 30	Lütke.	1004
Yap, Eap, or Unawb Id., N. id. -	Hunter, 1791	9 37 25	138 7 50	D'Urville.	1035
Hunter Reef -	"	9 57 30	138 22 0	Hunter.	1007
Ngoli or Matelotas Ids., N. id. -	Villalobos, 1545	8 35 0	137 40 0	Cheyne.	1007
PALAU or PELEW ISLANDS.					
Kyangle Island, centre -	"	8 2 30	134 38 30	Knorr.	1011
Babelthuap Id., N.E. extr. -	"	7 40 30	134 38 45	"	1011
Korror Hr., Malackan Pier -	"	7 19 0	134 31 45	Gravenor.	1012
Eil Malk Island, S.E. point -	"	7 11 30	134 27 30	Knorr.	1013
Pelelew Id., island off S. point -	"	6 68 0	134 16 15	"	1014
Angaur Id., id. off S.W. pt. -	"	6 50 0	134 10 0	"	1014
		Lat. S.			
Anacherotes Island -	Bougainville, 1768	0 50 0	145 30 0	Bougainville.	1015
Commerson Island -	"	0 40 0	145 17 0	Chart.	1016
Boudeuse Island -	"	1 26 0	144 34 0	Bougainville.	1016
L'Echiquier Id., N.E. point -	"	1 3 0	144 24 0	Bridge.	1016
Hermit Islands, Pémé Islet -	Maurelle, 1781	1 28 50	145 5 45	Sanders, 1874.	1016
Matty Island -	Carteret, 1767	1 46 0	142 56 0	D'Entrecasteaux	1017
Durour Island -	"	1 33 40	143 12 30	"	1017
Tiger Island -	Bristow, 1817	1 45 0	142 2 0	Bristow.	1017
NEW GUINEA.					
Cape King William -	"	6 1 0	147 38 0	Moresby.	1018
Astrolabe B., Pt. Constantine -	"	6 29 53	145 46 8	Chart.	1019
Humboldt Bay, Challenger Cove -	"	2 36 0	140 42 11	H.M.S. Challenger	1021
Point D'Urville -	"	1 24 0	137 47 0	Jacquinet.	1022
Geelvink Bay, Jobi, Anus Harbour, Station Point -	"	1 44 30	135 49 0	Powell.	1023
Danger Islet -	"	0 17 0	135 3 0	Chart.	1024
Port Dorei, Mana-Souari I. -	"	0 54 0	134 7 0	"	1024
		Lat. N.			
St. David or Freewill Islands -	Warwick, 1761	0 57 0	134 21 0	Williams.	1024
Helen Reef, N.N.E. end -	Seton, 1794	3 0 0	131 52 0	Pederson.	1025
Tobi or Lord North Island -	Lord North, 1781	3 3 0	131 4 0	Chart.	1026
Mariere or Warren Hastings I. -	Hutchinson, 1761	4 19 30	132 28 30	McClellan.	1026

Anna
SansoISLAND
TITClipper
PassionREVILL
Socorwa
S. BeRoca
SantaSul
JohnstonGaspard
N.W.Wakes I
MARIANAGUAM,
SantUma
PointPort
SantaPort
Rota IslAguijan
Tinian Ivillage
Saipan IFarallon
AnataxSariguan
FarallonRocks
Guguan IAlamagan
Pagan IsAgrigan I
AsuncionUrracas I
Guy RocPajaros
Lindsay IslFlorence Sh
Dugay Trou

SANDWI

HAWAII, Cap
Hilo, or ByroIsland
MakshanaoMauna Ken V
Upolu PointKawaihae Ba
Mauna Huala

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TABLE OF GEOGRAPHICAL POSITIONS.

	Discoverer.	Lat. North.	Long.	Authorities.	Page
Kailua Bay, Kamehameha's Tomb.			Long. W.		
Kealakokua Bay, Cook's monument.		19 37 20	156 4 20	Duperrey.	1080
Mauna Loa Vol. Pondulum Peak		19 29 0	156 2 40		
Ka Lae or South Point		19 28 0	155 38 0	Child.	1082
Kilauea Volcano		18 54 0	155 41 45	U.S. Ex. Expedn.	1072
MAUI, Cape Hanamania		19 25 0	155 18 0	"	1085
Kauiki Head		20 35 0	156 25 0	"	1072
Mauna Haleakala, summit		20 46 0	156 0 10	Chart.	1086
Kahului Harbour, flag-staff		20 42 35	156 15 8	"	1086
Lahaina, light		20 54 15	156 27 49	"	1086
Makona, North point		20 52 0	156 42 30	"	1087
Molokini Island		20 39 0	156 28 0	"	1087
KAHULAU, North end		20 38 40	156 30 45	Chapp.	1089
Koulaikahiki, or West point		20 37 30	156 35 0	Chart.	1090
LANAI, Cape Kamaiki, S.E. pt.		20 28 0	156 43 0	"	1090
Point Kaena, N.W. point		20 46 0	156 51 30	"	1090
MOLOKAI, Halawa, or E. point		20 56 0	157 4 0	"	1090
Lae o ka Laau Point, light		21 9 0	156 43 0	"	1090
OAHU, Cape Makapua		21 6 0	157 19 0	"	1091
Waimea Bay, head		21 18 15	157 39 20	"	1092
Kaena Point		21 38 0	158 4 0	"	1093
HONOLULU, Custom-ho. ltho.		21 34 13	158 16 55	"	1094
KAUAI, Nawiliwili Harbour, Observation spot		21 18 6	157 52 10	Jackson.	1094
Koloa Bay		21 57 50	159 27 20		1095
Waimea		21 52 0	159 28 30	Chart.	
Point Mana		21 57 12	159 40 0	"	1100
Hanalee, Charlton Farm		22 1 30	159 47 30	"	1101
NIHAU, Kawaihoa Point		22 13 0	159 30 0	"	1101
Oku Point, N. point		21 48 0	160 13 30	"	1102
Lohua, Oreehoua, or Egg Island, W. pt.		21 59 45	160 6 30	"	1102
Kaula or Tahooro Island		22 1 0	160 8 45	"	1103
Nihoa or Bird Island	Douglas, 1789	21 39 0	160 32 30	"	1104
		23 3 15	161 45 0	"	1105
				"	1105
ISLANDS AND SHOALS, NORTH OF LAT. 20° N.					
Los Alijos Rocks	Marquina, 1791	24 58 0	115 52 36		
Guadalupe Island, N. point		29 10 50	118 17 30	Chart.	1107
Reed Rocks	Reed, 1850	37 35 0	137 30 0	Tessan.	1107
Necker Island, centre	La Perouse.	23 35 0	164 40 0	Redfield.	1109
French Frigates Shoal, islet	La Perouse, 1786	23 46 0	166 16 10	Brooke.	1109
Brooks Shoal, 14 fathoms	Brooks, 1850	23 52 0	166 46 0	Brooke.	1110
Gardner Island	Allen, 1820	25 0 40	167 59 0	Brooke.	1112
Maro Reef, N.W. end	Allen, 1820	25 31 0	170 37 30	Brooke.	1112
Dowset Reef	Kamehameha	25 13 0	170 38 0		1112
Laysan or Moller Island, centre	American	25 47 17	171 52 47	Captain.	1113
Lisiansky Island, centre	Lisiansky, 1805	26 0 0	173 57 0	Brooke.	1113
Pearl and Hermes Reef, N.E. extreme				Brooks.	1114
Brooks or Midway Islands	Wrecks, 1822	27 56 30	175 46 0	Reynolds.	1116
Welles Harbour					
Middlebrook Island, N. pt.	Brooks, 1859	28 14 0	177 23 15		
Ocean or Curé Island, Sand Id.		28 13 30	177 18 20	"	1118
Krusenstern Rock	American	28 24 45	178 27 45	"	1118
	Lisiansky, 1805	22 15 0	175 37 0	"	1122
			Long. E.	Lisiansky.	1123
Patrocinio or Byers Island (e.d.)	Zipiani, 1799	28 9 0	175 48 0	Zipian. (?)	1123
Morrell Island (e. d.)	Morrell, 1825	29 57 0	174 31 0	Morrell.	1123
Melish Bank		34 25 0	178 47 0		1124
Marcus Island		24 14 0	154 0 0	Belknap.	1125
Marshall (or Jardines) Islands	Marshall, 1788	21 40 0	151 35 0	Marshall.	1126

Marg
 Gran
 Arzo
 Par
 Kat
 Pee
 Port
 Bail
 VOLCA
 Sulpi
 San
 Forfann
 Rosario
 Linda o
 Douglas
 Kendrick
 Raza Isl
 Borodino
 Tanege s
 Mago no
 Yakuno s
 Yerabu si
 Take sima
 Iwo ga sim
 Yakuro or
 Uae or Tik
 Kuro sima
 Ingersoll R
 LINSCHOTEN
 Firsac or
 rock -
 Kutsino si
 Kohobi sim
 Hebi sima
 Naka sima
 Fira sima
 Suwa sima
 Akuisi sima
 Simago Isl
 Tokara sima
 Yoko sima
 Lu-chu on Lo
 Sandon Rock
 Amami oo si
 Island, No
 Hancock Bay
 Kikai-ga sim
 Kakiroma or
 Iwo sima or
 South peak
 Yerabu sim
 South peak
 Yori sima, sum
 Okinawa sima
 chu, Napha-
 Point
 Deep Bay
 Cape Heto
 Cape Yakimu
 Kerama Islands
 East side
 Komisang, South
 Tu sima
 Agunye, S.W. P

TABLE OF GEOGRAPHICAL POSITIONS.

xxxii

	Discoverer.	Lat. North.	Long. East.	Authorities.	Page
Margaret (or Malabrigos) Ids. -	Magee, 1773	27 20 0	145 45 0	Magee.	1127
Grampus Islands (p. d.) -	Monroes, 1788	25 40 0	146 40 0	Krusenstern.	1127
ARZOBISPO or BONIN ISLANDS -	Coffin, 1824				
Parry Group, North rock -		27 44 35	142 7 0	Beechey.	1130
Kater Island -		27 30 0	142 15 0	"	1130
Peel Island, S.W. islet -		27 2 0	142 10 0	"	1131
Port Lloyd, Ten-Fm. Hole -		27 5 35	142 11 30	"	1132
Bailey Island, South islet? -		28 30 0	142 13 0	"	1136
VOLCANO ISLANDS, S. Augustino	Torres, 1543	24 14 0	141 20 0	Krusenstern.	1137
Sulphur Island -		24 46 0	141 19 0	Chart.	1137
San Alessandro Id., peak -	San Juan, 1543	25 24 54	141 15 45	U.S.S. Alert.	1137
Forfana Island -	Nantilus, 1801	25 34 0	143 0 0	Chart.	1138
Rosario or Disappointment Id. -	Linda, 1851	27 13 0	140 46 0	Quin.	1139
Linda or Euphrosyne Rock (?) -	Douglas	21 43 30	140 50 0	Linda, &c.	1139
Douglas Reef or Farece Vela -	Kendrick	20 30 0	136 10 0	Kendrick.	1140
Kendrick Island -	Cannoniere, 1807	24 35 0	134 0 0	Knorr.	1141
Rasa Island -	Ponafidin, 1820	24 28 0	131 26 0	Perry.	1141
Borodino Isles, centre of S. id. -		26 52 45	131 12 15	Cécille.	1142
Tanaga sima, North end -		30 50 0	131 3 30	"	1142
Mago no sima, East point -		30 44 0	130 52 0	"	1143
Yakuno sima, Mount Motomi -		30 20 0	130 31 0	"	1143
Yerabu sima, highest peak -		30 27 0	130 14 0	"	1143
Take sima, centre -		30 43 30	130 26 30	"	1143
Iwo ga sima, highest peak -		30 47 15	130 18 0	Chart.	1143
Yakuro or Powhattan Reef -		30 42 0	130 19 0	Powhattan, 1860	1143
Use or Trio Rocks, centre rock -		30 45 0	130 7 0	French cht., 1840	1144
Kuro sima, centre -		30 49 30	129 56 0	"	1144
Ingersoll Rocks, highest -		30 50 0	129 26 0	"	1144
LINSCHOTEN ISLANDS.					
Firese, or Blake Reef, highest					
rock -					
Kutsino sima, summit -		30 4 0	130 3 0	Cécille.	1145
Kohobi sima -		29 59 0	129 56 0	"	1145
Hebi sima, peak -		29 53 0	129 38 0	"	1145
Naka sima, peak -		29 54 0	129 33 0	"	1145
Fira sima -		29 52 0	129 52 30	"	1145
Suwa sima -		29 41 0	129 32 30	"	1145
Akuisi sima -		29 38 0	129 42 0	"	1145
Simago Islands, highest -		29 27 0	129 37 30	"	1146
Tokara sima -		29 13 0	129 20 30	"	1146
Yoko sima, summit -		29 8 0	129 13 30	"	1146
LU-CHU or LOO-CHOO ISLANDS.		28 48 0	129 2 0	"	1146
Sandon Rocks -	Viscount Sandon, 1850.	28 44 0	129 47 30	"	1147
Amami oo sima or Bungalow					
Island, North end -		28 31 40	129 42 0	Chart.	1147
Hancock Bay, Outer Point -		28 18 0	129 12 30	Walker.	1148
Kikai-ga sima, summit -		28 18 0	129 59 30	Chart.	1149
Kakirouma or Tok sima, pk.	Broughton, 1797	27 45 0	128 58 0	"	1149
Iwo sima or Sulphur Island,					
South peak -		27 52 30	128 14 0	"	1149
Yerabu sima or Wukido,					
South peak -		27 22 30	128 35 0	"	1149
Yori sima, summit -		27 2 0	128 26 30	"	1150
Okinawa sima, or Great Lu-					
chu, Napha-kiang, Abbey					
Point -					
Deep Bay -		26 12 22	127 40 50	U.S. Vandalia.	1150
Cape Heto -		26 35 35	127 59 42	Chart.	1153
Cape Yakimu -		26 51 30	128 17 0	"	1154
Korama Islands, Ago ura,		26 5 0	127 41 0	"	1155
East side -					
Komisang, South point -		26 13 54	127 20 20	"	1155
Tu sima -		26 17 30	126 49 30	"	1156
Agunye, S.W. point -		26 35 30	126 51 0	"	1156
		26 35 0	127 14 0	"	1156

TABLE OF GEOGRAPHICAL POSITIONS.

	Discoverer.	Lat. North.	Long. East.	Authorities.	Page
MRIACO-SIMA ISLANDS.					
Kumi Island, West end -		24 25 0	122 56 0	Chart.	1157
Ku-kien-san, West end -		24 19 0	123 38 0	"	1158
Hasyokan, or Sandy Island -		24 3 0	123 46 0	"	1158
Pa-chung-san, Port Had- dington, North point -		24 25 0	124 6 30	"	1159
Tai-pin-san, Junk Bay, South point -		24 46 30	125 16 0	"	1160
Hoa-pin-su, North side -		25 47 7	123 30 30	"	1162
Ti-a-usu -		25 58 30	123 40 0	"	1163
Raleigh Rock -	HMS. <i>Raleigh</i> , 1837	25 57 0	124 2 0	"	1163
Recruit Island -	Lyall, 1861	25 57 40	124 43 0	mean.	1163

PAGE
49.

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No

ADDENDA.

(The following information has been received too late for insertion in the Book.)

PAGE

49. | **Industrie Rock** could not be found on a close examination of the locality by the U.S.S. *Ranger*, and has been removed from the charts. A 2-fathoms shoal and a rock awash lie about half a mile off shore, in lat. $12^{\circ} 8' 40''$ N.
53. | **PORT REALEJO, or Coxintoc.**—The lighthouse on Cardon Island has been burnt. A temporary light is shown, visible 2 or 3 miles.
77. | **SAN JOSE DE GUATEMALA.**—A railway is completed to the capital, which is about 80 miles distant, and 5,000 ft. above sea-level.
80. | **Champerico.**—A railway is completed to Retalhuleu.
89. | **Morro Ayuca.**—A rock, with 10 ft. water on it, lies $1\frac{1}{2}$ mile S.W. $\frac{1}{2}$ S. from the southern extreme of Ayuca Point.
95. | **Sacrificios Bay.**—**Sacrificios Rock**, of 11 ft., on which the U.S.S. *Tuscarora* touched, lies near the fairway entrance to the inner anchorage, with the West extreme of Sacrificios Island bearing N. by W. $\frac{3}{4}$ W., the S.E. extreme N.E. by N., nearly, and 840 yards E. by N. $\frac{1}{2}$ N. from the South extremity of the West entrance point.
131. | **Piastla Point.**—The reef is reported to extend $1\frac{1}{2}$ mile off. The best anchorage northward of it is with Piastla Point bearing S. $\frac{1}{4}$ E., and San Miguel Point N.W.
171. | **San Lorenzo Reef** has a black buoy on its southern edge.
197. | **San Geronimo Island.**—Heavy breakers were seen from the U.S.S. *Ranger*, just North of San Antonio Point. The North breakers bear, approximately, S.E. by S. $\frac{3}{4}$ S. from Baja Point, and N. $\frac{3}{4}$ W. from San Geronimo Island; the South breakers, S.E. by S. $\frac{3}{4}$ S. from Baja Point, and S.E. by E. $\frac{1}{4}$ E. from the island.
214. | **Santa Monica.**—The pier has been destroyed; Wilmington is now the only port of Los Angeles.

North Pacific.

ADDENDA.

PAGE

237. | **Montara Point.**—The *Fog Whistle* now sounds a blast of 5 seconds in every half minute.
245. | **SAN FRANCISCO.**—An **ELECTRIC** light, visible a long distance seaward, is shown on *Telegraph Hill*, as a guide for the ferry boats.
Time Signals.—On *Telegraph Hill*, and on *Mare Island* (p. 246), balls are dropped at noon, mean time of the 120th meridian.
329. | **PORT ANGELOS.**—During fogs a *Bell* (in a white pyramidal structure, 108 yards N.W. by N. from Ediz Hook lighthouse) is struck by machinery once every 15 seconds.
337. | **PUGET SOUND.**—A steam *Fog Whistle*, giving a blast of 6 seconds in every minute, is established on *Robinson Point*, Maury Island, in lat. 47° 23' N., long. 122° 23' W.
382. | **ACTIVE PASS.**—On *Georgina Point*, East side of the northern entrance, is a square white wooden lighthouse, 42 ft. high, showing a *fixed bright* light, elevated 55 ft., and visible 12 miles, between S.W. $\frac{1}{2}$ S. and E. $\frac{1}{2}$ N., through West and North.
756. | **CAPE SOYA LIGHTHOUSE.**—On Cape Soya, the North extreme of Yezo, is an iron tower, 54 ft. high, painted white with three black bands. It shows a *revolving* light, with a flash every half minute, elevated 132 ft., and visible 17 miles, between W. $\frac{3}{4}$ S. and E.S.E., through North.
 In foggy weather a *Bell* is sounded twelve times every minute.
 The light and fog signal are discontinued from December to March, inclusive.
830. | **Macedonian Reef.**—*Kamegi Shoal*, with $1\frac{1}{2}$ to $2\frac{1}{2}$ fathoms on it, lies about $1\frac{1}{2}$ mile W. $\frac{1}{2}$ S. from Macedonian Reef. It is about 7 cables in extent N.E. and S.W., with a breadth of 3 cables.

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THE NORTH PACIFIC OCEAN.

CHAPTER I.

THE COAST OF CENTRAL AMERICA.

THE country whose southern coast is described in this chapter, includes that long, narrow, and irregular tract which forms the junction between the northern and southern continents of America. Up to a recent period it was, politically and socially, most unimportant, and our knowledge of it was almost inferior to that acquired by the early Spanish possessors. But since the colonization and development of the resources of North-west America, consequent chiefly on the gold discoveries, it has rapidly drawn the attention of all interested in shortening the highways of commerce, to the facility it affords for an inter-oceanic transit. The great success and surpassing utility of the Panama Railroad, completed January 27th, 1855, increased the desire that a ship canal should be cut through the isthmus, and an attempt to carry out this grand project is now being made, under the direction of M. F. de Lesseps, as hereafter mentioned.

The eastern portion of the great isthmus, that of Panama and Darien, belongs to the United States of Colombia (formerly called New Granada), which have the *exclusive* privilege of this important transit. On the western boundary of this state is the republic or state of Costa Rica, one of the former confederation of republics of Central America.

This territory, including an area of 165,054 square miles, is now divided into the five republican states of Guatemala, Honduras, Nicaragua, San Salvador, and Costa Rica. The Federal District, which up to 1839 was
North Pacific.

THE COAST OF CENTRAL AMERICA.

common to them, was a circle round the capital, San Salvador, 20 miles in diameter, with a further extension of 10 miles to the South, so as to include its port, the roadstead of Libertad, on the Pacific. Guatemala, the westernmost state, is divided from that of Mexico by the Rio Sinalapa or Tilapa, falling into the Pacific in about long. $92^{\circ} 18' W$.

The N.E. coast of the isthmus, that is, the West India part, was discovered by Columbus in 1502. The greater portion of it was usurped by the Spaniards by 1524, and it was erected into a captain-generalship by the Emperor Charles V. in 1527. From the fact of its being only a minor state, its expenditure was on a less magnificent scale, and consequently comparative benefit accrued to the people. On the overthrow of the Spanish power, Guatemala became independent in 1821, and was subsequently incorporated with Mexico; but when Iturbide fell, it separated, and declared its independence on July 1st, 1823, adopting a constitution drawn up for it by Mr. Livingston, the U. S. statesman. Affairs were, however, far from settled, and much internal commotion continued; but all Spanish influence was thrown over at Omoa, September 12th, 1832. Notwithstanding its very great geographical importance, the resources of the country have hitherto been very imperfectly developed.*

* The principal authorities for any description of Central America are the works of Padre Thomas Gage, an English friar, 1632, an excellent and interesting work; that of Don Domingo Juarros, a native of Guatemala, in 1780, which has been translated by Lieutenant Bailey, R.M., 1823; Thomson's Visit to Guatemala in 1826, gives an excellent account of much of the interior; Reise naar Guatemala, 1829, by J. Haefkens, and a work by the same author, Central Amerika, 1832, both useful; Narratives, &c., by Mr. Roberts, chiefly on the Atlantic side; a paper in the Geographical Journal, vol. vi., 1836, on Costarrica, by Col. Don Juan Galindo (an Englishman); Dictionario de las Indias Occidentales, by Col. Don A. de Alcedo; L'Isthme de Panamá, &c., by M. Michel Chevallier; the important works of Capt. Sir Edward Belcher, the Voyage of the *Sulphur* and the Voyage of the *Herald* by Dr. Seemann; the Reconnaissances Hydrographiques of Capts. de Lapelin and de Rosencourt, 1854 and 1857. Upon its Antiquities and general information, the works of Dupais, Waldeck, Kingsborough, Rouchaud, and Dumartray, may be consulted. One of the most interesting is that by Mr. Stephens, who describes the ruins in Yucatan, but who contains the various papers by Mr. E. G. Squier, 1858. The work of Capt. Bedford Pim, R.N.; the Travels of Dr. Scherzer; and the numerous reports issued by the engineers and explorers of the various inter-oceanic canals and railroads, which have been so industriously brought before the world, must also be mentioned.

Among the later works on Central America, are: A Ride Across a Continent, by F. Boyle, F.R.G.S., 1868; The Naturalist in Nicaragua, by T. Belt, F.G.S., 1874; and Across Central America, by J. W. Boddam Whetham, 1877. Another valuable work was published in 1883 by Senor R. S. Pereira, entitled, Les Etats-Unis de Colombie, containing much information, and illustrated by maps. An interesting account of a visit made by Mr. A. P. Maudsley, to several ruined Indian cities, will be found in the "Proceedings of the Royal Geographical Society," April, 1883.

Mountains.—In describing the general physical features of the country, these naturally become the first in order, influencing as they do the rest of its surface.

The elevated range (a continuance of the Andes) in Central America has no determined name, and is in many parts without a visible existence. It commences in Costa Rica, at a distance from the Pacific of about one-fourth of the whole breadth of the isthmus, and, at the beginning of its course, separates this state from Veragua; in Nicaragua it inclines close to the borders of the Pacific, leaving the lakes on the East; in Honduras it returns towards the Atlantic, leaving the whole state of Salvador on the South; traversing Guatemala, the new city and Chimaltenango stand on the top of the ridge, which now becomes more elevated as it approaches Mexico, and branching into various groups, forms, in the western part of the state, that region which is denominated the highlands. The population on the Pacific side of the chain is much greater in proportion to its extent than on the Atlantic slope.

The chain is apparently interrupted in its course through Central America by the transversal valleys containing the Lake of Nicaragua and the plain of Comayagua, but still the elevation between the two oceans is considerable, and will be more dwelt upon when we describe the proposed canals, which would render Central America of very great importance in the commercial world, should they ever be carried into execution.

The *Lakes* of Nicaragua and of Leon, or Managua, are amongst the most important features of the country. On the Pacific side, the rivers which are met with rarely have their sources above 60 miles from the sea. The Lempa is the principal, but is not navigable. The next in size is the Rio Choluteca, falling into the Bay of Conchagua.

Although not possessed of good harbours, yet it is still superior to Mexico in this respect. The principal on the Pacific coast are, Punta Arenas, Realejo or Corinto, La Union, Libertad, Acajutla, and San José.

Volcanic phenomena are frequent, and their devastating effects have been, at times, very severe. The principal volcanos now, or recently, in activity, are those of Coseguina, Isaleco, de Agua, and de Fuego, and many others; of these the Volcan de Agua is the loftiest, being differently stated as 14,895 or 12,620 ft. above the Pacific.

These volcanic cones, often separated from the general chain, and sufficiently lofty to be visible 60 miles off, are most magnificent land-marks, and are thus most important aids to navigation. There are usually *eight* of these volcanos in activity—Isaleco, las Pilas, Atitlan, Fuego, San Miguel, Momotombo, Orosi, and Cartago. Of these the first, Isaleco, is an excellent beacon light, which overtops Sanseonate; las Pilas is of recent formation, thrown up in 1850, and although it has been in full eruption cannot be seen from the offing. The rest of these volcanos generally emit only smoke.

The *productions* of Central America are important. The Tisingal gold

THE COAST OF CENTRAL AMERICA.

mines, near the Chirique Lagoon, on the Atlantic side of Costa Rica, have afforded as much riches as those of Potosi; but the vegetable productions are of greater importance than the mineral. Of cultivated articles, cocoa, indigo, coffee, sugar, and cotton, are the most prominent. These crops vary with the height of the country. At a lower elevation than 3,000 ft., indigo, sugar, and cotton are grown. Cocoa is chiefly grown along the shores of the Pacific, and that of Soconusco was esteemed by the Spaniards to be the best furnished by their American possessions. Indigo is general throughout the country. Cochineal, or the nopal cactus, is cultivated between the heights of 3,000 and 5,000 ft., particularly in the neighbourhood of Guatemala. Of native woods, &c., abundance is produced, but principally refer to West India trade.*

The TRADE on the coast of Central America is increasing rapidly; among the exports, coffee holds the first place, with large quantities of dye-woods, indigo, cochineal, sugar, &c. At Punta Arenas, in the Gulf of Nicoya, excellent coffee is exported, said to be the best in the Pacific.

Climate.—The whole of Central America is situated between the tropics; but the temperature and salubrity of its climate are as variable as are the diversities of its abrupt elevations, mountains, plateaux, ravines, sands, low districts, lakes, and forests.

The country is within the zone of the N.E. trades, which, sweeping across the Atlantic, reach the continent almost saturated with vapour. The portion of moisture which is deposited on the Caribbean Islands is probably quite restored to them in passing over the Mexican Gulf, and is then precipitated on the eastern slope of the high mountain ranges of Guatemala, Honduras, and Costa Rica, giving rise to a multitude of streams and rivers, and causing all that face of the country to be a dense and almost impenetrable forest of rank vegetation, unfit for the home of civilized man, and still occupied by the same wild tribes that were found at the discovery of the New World.

On the Pacific side, however, the trade wind still blows, for the mountains are not sufficiently high to intercept their entire violence, but it is deprived of much of its moisture, and thus the climate is very different to the Atlantic side. The climate is comparatively cooler, much drier, and consequently very much more healthy.

It is rare to witness an entire day of rain, even in the rainy season, although sometimes, but rarely, a rain of several days' duration occurs, which are called by the Spaniards *Temporales*.

On the sea-coast of the Pacific, the seasons correspond with those of the table lands, but the temperature is much hotter. It is said that the Pacific

* "This country is so pleasing to the eye, and abounding in all things necessary, that the Spaniards call it Mahomet's Paradise."—*Gage*, 1650, p. 165. An interesting account of the author's twelve years' residence in it will be found in his curious and valuable book.

shores are healthy, although they are almost entirely covered with woods. This salubrity is, however, not without exceptional districts.

On the coast, during the fine season, which commences in November and ends in May, the land and sea breezes blow alternately, with a clear sky and but little rain; strong winds rarely occur during this period, except at the full and change of the moon, when occasionally a strong breeze from the northward may be experienced.

In the rainy season, May to November, heavy rains, calms, light variable breezes, with a close sultry atmosphere, heavy squalls, with thunder and lightning, and not unfrequently strong gales from the S.W., are prevalent.

During the fine season, the land and sea breezes set in regularly; the former are called *el Terral*, and the latter *la Virazon*. The only winds to be guarded against at this season are the northers. These violent gusts give no warning but the noise created by them a few moments before they burst; sometimes a thick fog sets in beforehand, which is dissipated at the first gust. These gusts are more frequent near the Gulf of Tehuantepec or abreast of the Gulf of Papagayos.

In the rainy season calms are frequent, and the sea and land breezes, which are felt on fine days, have no regularity. The prevalent winds then are from S.E. to S.W., blowing strongly and in squalls, bringing bad weather and torrents of rain for twelve or fourteen days at a series. During this season nearly every afternoon, about 3 or 4 o'clock, a violent gust sets in from the N.E. and lasts till daylight. These gales are called *chubascas*, and resemble the tornados of the African coast.

On the coast of Central America the *currents* are variable, but almost always setting to the S.E., sometimes rather strong. The land wind never blows far off shore, and, except in the harbours, is not certain; the sea breeze is seldom felt, but there are of course exceptions.

Population.—The inhabitants of Central America comprise three classes: whites, or creoles of Spanish race; mestizos, or the offspring of whites and Indians; and aboriginal natives. There are but few negroes or Zamboes.

There is considerable difficulty in arriving at a true estimate of the population of the isthmus in the absence of any official data. Mr. Squier carefully considered the question, and from various authorities he assumed the total number of inhabitants of the five states, in 1858, at 2,108,000, distributed thus:—Costa Rica, 135,000; Nicaragua, 300,000; San Salvador, 433,000; Honduras, 350,000; and Guatemala, 890,000, San Salvador being much the most densely populated. Of these, 100,000 were whites, 800,000 of mixed white and coloured races, Ladinos, Mulattoes, &c., 19,000 negroes, and 1,189,000 Indians. The population is now estimated at 2,600,000.

1. THE COAST OF THE UNITED STATES OF COLOMBIA, OR NEW GRANADA; PANAMA TO POINT BURICA.

In our volume descriptive of the South Pacific Ocean, the directions for the coasts of South America terminate with the Gulf of Panama. And this, although it lies eight degrees North of the Equator, will be a fitting commencement for our present work, as it is really the first point touched on by the transit trade from the Atlantic side. We therefore repeat from that work those directions which refer to this portion of the coast of the United States of Colombia, or New Granada.

Garachiné Point on the East, and Cape Mala on the West, may be taken as the limits of what is called the Gulf of Panama. These points lie E.N.E. and W.S.W., *true*, 103 miles apart. The depth of the gulf within this line is about 80 miles, the city of Panama being at its head. Panama Bay is the space between the main and the Pearl Archipelago.

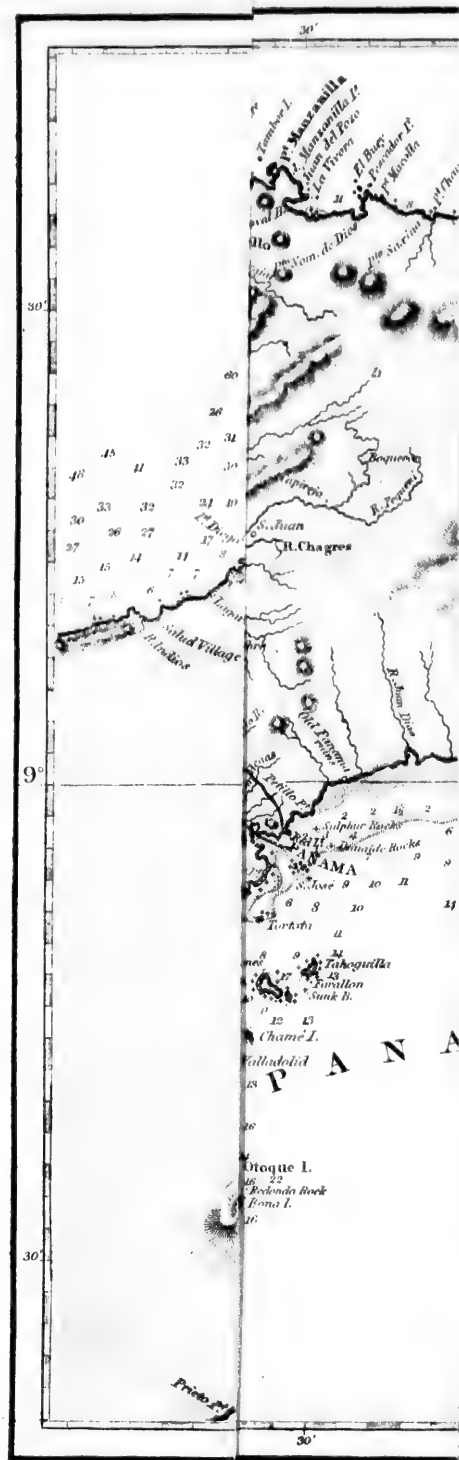
Until the survey of 1849, by Captains Kellett and Wood, R.N., we were dependent for our knowledge on the old but excellent Spanish charts, and on the still singularly correct description given by Dampier, two centuries since. The following description of the coasts and islands of the gulf is taken from the Admiralty Directions, with additions from other sources.

The **BAY of SAN MIGUEL**, to the N.E. of Garachiné Point, on the eastern side of Panama Gulf, was well known to the Buccaneers, who used it as the entrance to the Pacific in their overland journeys from the Gulf of Darien, which they generally accomplished under 10 days. After Dampier's time it was almost forgotten until 1851, when the idea of a ship canal was suggested to connect it with Caledonia Bay, in the Gulf of Darien. The entrance to the gulf is $6\frac{1}{2}$ miles wide, between *Lorenzo Point* on the North, and *Patino Point* on the South.

Buey Bank, an extensive shoal, drying in patches at low water, on which a heavy sea breaks, is 6 miles in circumference, its inner edge lying nearly $1\frac{1}{2}$ mile S.W. from Lorenzo Point, but the passage between should not be used, as there is only 10 ft. water in it, and generally a heavy swell. A spit with 12 ft. extends off its S.W. end for $1\frac{1}{2}$ mile, and only $4\frac{1}{2}$ fathoms is found nearly 5 miles from it; vessels should not stand within that depth. Colorado Point kept open of Patino Point, bearing N.E., is a good mark to clear this bank, and also for running into the bay. Further particulars of the bay, and of the approaches to Darien Harbour, will be found in the South Pacific Directory.

DARIEN HARBOUR, a magnificent sheet of water extending for 11 or 12 miles in a S.E. direction as far as the village of Chupigana, is formed by the junction of the Tuyra and Savannah Rivers. The depth of water from Paley Island as far as the mouth of the Savannah, a distance of 2 miles, is from 10 to $4\frac{1}{2}$ fathoms, beyond which there is not more than 12 to 18 ft. at low water





springs. The best place for anchoring is off the village of Palma, 1 mile to the southward of Price Point, on the South side of the Boca Chica, in from 7 to 10 fathoms, at about 3 cables from the shore.

The *River Tuyra*, the *Santa Maria* of the Spaniards and Buccaneers, rises in lat. $7^{\circ} 40'$ N., and enters Darien Harbour near the village of *Chupigana*. The *River Chuchunague*, which flows into the Tuyra, rises in lat. $8^{\circ} 50'$ N., westward of Caledonia Bay on the Atlantic; its course appears to have been the favourite track of the Buccaneers from the Atlantic to the Pacific.

Savannah River, which was the one generally preferred for the proposed junction of the oceans, rises in lat. $8^{\circ} 44'$ N., and a few miles from its source meets the *River Lara*, where the bottom is level with the half-tide.

It is high water, on full and change, in Darien Harbour, at 4^h , and the spring rise is said to be 24 ft. The tides in the narrows at the entrance run proportionally strong, and great care should therefore be taken.

San José Bank, a dangerous shoal, 1 mile long by three-quarters of a mile broad, in the centre of which is *Trollope Rock*, with only 2 ft. water, lies in the fairway of ships bound to Panama from the southward, being 15 miles W. $\frac{1}{2}$ S. from Garachiné Point, and 9 miles E.S.E. from Galera Island, the south-eastern of the Pearl Islands. It is easily avoided either by keeping on the main shore until Garachiné Point bears to the southward of East, or by passing about 2 miles from Galera Island, taking care of the shoal patch and rocks off its southern side.

PERLAS, or PEARL ISLANDS, also known by the names of *Islas del Rey*, *Islas del Istmo*, and *Islas de Colombia*, form an archipelago on the eastern side of the Bay of Panama, consisting of sixteen islands and several rocks. *Isla del Rey* is the largest, San José, Gonzales, Casaya, Saboga, and Pacheca are of secondary, and the rest of minor importance. There are from 30 to 40 fishing villages scattered about these islands, containing about 2,000 inhabitants, chiefly engaged in the pearl fishery, which is said to produce about two gallons of pearls a year; the shells also form a lucrative article of commerce much inquired after by French vessels. In 1874 the government prohibited any oysters being dredged for the space of seven years, on account of a disease having appeared among them, probably owing to over-fishing. These islands are low and wooded, the soil fertile, but not much cultivated; most of them belong to merchants at Panama, who employ negroes to plant and cultivate them. The numerous cocoa-nut groves, and bright sandy beaches, intersected by small rocky bluffs crowned with trees, give these islands a pleasant appearance.

Pacheca, *Saboga*, and *Contadora*, with the islets of Bartholomew and Chipre, are a group in the northern part of the archipelago, forming between them a good and capacious harbour, well suited as a dépôt for steamers. Pacheca and Contadora are covered solely by palm trees, unmixed with any others, which is singular. Saboga, the largest island, on the East side of

which is a considerable village, has a reef extending $1\frac{1}{2}$ mile to the northward, which, with Chipre to the southward, forms the western side of this harbour, Pacheca and Bartholomew being on the northern, and Contadora on the south-eastern side; the latter island has 5 fathoms close to its N.W. shore, which is low and well adapted for wharves.

This harbour is about 2 miles long by nearly 1 mile broad, with an average depth of 9 fathoms; it has three entrances, each possessing a 5-fathoms channel, which may be used as best suited to wind and tide. It is high water, on full and change, at Saboga Island, at 4^h: springs rise 14 ft.

Vessels using the *Pacheca Channel* should pass within half a mile of the small island West of Pacheca, and stand to the southward until the centre of Bartholomew Island bears E. by S. $\frac{1}{2}$ S. Steer for it on this bearing until the northern islets off Saboga open westward of Saboga, bearing S. by W. $\frac{1}{2}$ W., when the vessel may haul to the southward for Contadora. Lieut. Fleet, H.M.S. *Gannet*, 1880, remarks that when entering by this channel upon the ebb tide, the East extreme of Saboga Island must not be brought to bear eastward of S. $\frac{1}{2}$ E. to avoid being set upon the N.E. rocks of the ledge extending North from Saboga, several of which cover at from one-third to two-thirds flood.

If entering by the *Contadora Channel*, a ship should pass half a mile to the eastward of Bartholomew Island, and not stand to the westward before the nearest islets North of Saboga open northward of Saboga, bearing W. by S. $\frac{1}{2}$ S., which leads through. Care must be taken not to open them too much, as there is a 2-fathoms patch off the N.E. end of Contadora to be avoided.

Vessels from the eastward using the *Saboga Channel*, which is reported to have several shoal spots in it and should be used with caution, should pass half a mile eastward of Contadora, and continue standing to the southward until the outer islet on the reef off the South end of Saboga opens southward of the same island, bearing W. $\frac{1}{2}$ S. Steering on this course will clear the vessel of the sunken rock in this channel, which lies nearly 1 mile off the South side of Contadora; and when Pacheca is shut in by Saboga, bearing N. $\frac{1}{2}$ W., you may stand to the northward, and run through the channel, which is steep-to on both sides. If this harbour were used, a few buoys would greatly assist the navigation.

Chapera and Pajaros lie next to the southward, with a 4-fathoms channel between them, but the ground is foul, and it should not be used. No vessel should attempt the passages South of Chapera Island, between it and Isla del Rey.

Casaya, Bayoneta, and Viveros, with several islets and rocks, are the largest islands on what may be termed an extensive reef stretching off from the N.W. point of Isla del Rey, about 8 miles long by 5 miles broad, the passages between them being foul with occasional strong tides. A shoal, $1\frac{1}{2}$ mile long by three-quarters of a mile wide, having only 9 ft. water on its shoalest part, lies nearly

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4 miles to the eastward of the North point of Casaya. The whole of these islands should be avoided by vessels bound up the bay.

ISLA DEL REY, the main island of the group, is about 15 miles long by 7 miles broad, with several peaks on it, the highest being about 600 ft. above the sea. Numerous islets, having deep water between them, lie off its western shore, extending 3 miles from the coast, but they should not be approached by strangers within the depth of 10 fathoms. *Cocos Point*, its southern extreme, is a remarkable promontory jutting into the sea, 4 miles long by about 1 mile wide, its extreme cliff being crowned (in 1859) by an umbrella-like tree, which makes it conspicuous. East of this point is the fine *Bay of St. Elmo*, with convenient anchorage in all parts, and a good stream of water at Lemon Point, in the bight of the bay.

The eastern shore has also islands off it, but they are steep-to, and may be approached to half a mile, with the exception of Canas Island at the eastern point, where there is a 3-fathoms patch lying outside a sunken rock, nearly $1\frac{1}{2}$ mile from the shore.

San Miguel, the principal town of these islands, on the North side of Isla del Rey, is of some size, possessing a conspicuous church; it is, however, badly situated, landing being difficult at low water. Two hills (the Cerro Congo and Cerro Vali) lie to the southward of it, the former being 481 ft. high. Supplies are uncertain and dear, being generally all sent to Panama. Care must be taken in approaching it, as the bottom is irregular, and rocks abundant.

GALERA, a small island, generally the first land made by vessels bound to Panama, is $7\frac{1}{2}$ miles E. $\frac{3}{4}$ S. of Cocos Point, like which it is remarkable for its umbrella tree. A cliff forms its southern side, sloping down to a beach on the North, and to the southward a reef runs off for nearly 1 mile. This island should not be approached within the depth of 10 fathoms, but there is a good passage between it and Cocos Point, by using which the vessel will be clear of San José Bank.

GONZALES, or *Pedro Gonzales*, lies on the West side of Isla del Rey, with a broad, deep channel between it and the islets before mentioned. It is about 12 miles in circumference, and has on its northern side two bays, protected from the North by the Islands of Señora and Señorita. These bays, called *Perry* and *Magicienne*, were re-examined in 1858 as to their capabilities for a depôt for steamers, and although not so good or so near to Panama as the harbour South of Pacheca, yet still have some advantages. They are divided by the little peninsula of *Trapiche*, off the East point of which is a rocky ledge, terminating in a shoal with 14 ft. water, 3 cables from the point.

A large stream of water runs into the sea on the western side of Magicienne Bay. This bay, however, is small and shoal, without the advantages of Perry Bay, which is 1 mile wide, and runs back for the same distance. *Señora* and *Señorita*, including the shoal off their eastern side, are about 1 mile long, and

North Pacific.

lie nearly the same distance northward of Trapiche, with a 7-fathoms channel between, steep-to on both sides.

Gonzales was purchased in December, 1857, by the British Government, of an American citizen for £1,000, the New Granada Government consenting and retaining the sovereignty. No building was to be erected on it, but a vessel was to be moored. It was intended as a watering station for H.M. fleet.

It is high water, on full and change, in Perry Bay, at 3^h 50^m, the rise being 16 ft. The tide stream is not felt in the anchorage, but there is a considerable set off the island, the flood setting to the northward, and the ebb to the southward, the latter being generally the stronger.

San José Island, about 6½ miles long by 3 miles broad, lies 4 miles directly South of Gonzales, the summit forming a table land. Nearly 2 miles S.E. from Iguana Point, the northern extreme, is a large waterfall, running into the sea, and forming an excellent watering place.

Passage Rock is a dangerous sunken rock, with 12 and 9 fathoms alongside of it, lying near the centre of the channel between San José and Gonzales, which otherwise is deep and clear. It is 1½ mile from Gonzales, and 2½ miles from San José. Vessels should keep between the San José shore and this rock.

The COAST.—*Brava Point* forms, with *Lorenzo Point*, from which it is distant 2 miles, the northern point of entrance to San Miguel Bay. Both these points are edged with reefs and outlying rocks.

Farallon Ingles is a small but high island, lying at the edge of the shoal off the River Buenaventura, about 5 miles to the northward of Brava Point; 12 and 15 ft. water is found on its western side. *Gorda Point*, bold and woody, with 4 fathoms close-to, lies 4 miles northward of the Farallon; there is less swell after passing this point. The *Pajaros* are two small rocky islets, 4 miles northward of Gorda Point, with 4 and 5 fathoms to the westward, but only 12 ft. between them and the shore. At these islets the 5-fathoms shoal commences, which continues in front of the coast round the Bay of Panama as far as Point Chamé, on its western shore.

The River Trinidad, 2½ miles northward of the northern islet, has a low rocky point, forming the S.W. point of the entrance. A 3-fathoms channel was found into this river, extending 1½ mile from the point. *Shag Rock*, a barren islet, frequented by birds, with shoal water round it, lies 2½ miles from this entrance. *Mangue* and *Majaguay*, 7 miles from the River Trinidad, are high, wooded islets at high tide, lying on a mud flat. There is a depth of from 10 to 12 ft. water to the westward of them. *Chiman River*, to the northward of these islets, is wide at the mouth, but shoal, being nearly dry at low water. On the eastern side, under a hill, is the small town of *Chiman*. This was the spot to which Pizarro retired in 1525, after beating about for 70 days with much danger and incessant fatigue, without being able to make any advance to the southward. He was here joined by Almagro, and the following year they sailed again for Peru.

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PANAMA.

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Pelado Islet, W. by S. 4 miles from Mangue Islet, directly off the mouth of the River Chiman, is a flat level islet of small extent, and about 60 ft. high; it has no trees, but is covered with a coarse prickly shrub. It is steep to on all sides, and forms a useful mark to vessels bound up the bay for Panama, who need not go in-shore of it.

Chepillo Island, 31 miles N.W. by W. $\frac{1}{2}$ W. from Pelado, is described by Dampier as the most pleasant island in the Bay of Panama; it lies off the mouth of the River *Chepo*, about 2 miles from the coast, and is 1 mile long by half a mile broad, very fertile, being low on the North side, and rising by a gentle ascent towards the South, over which is a remarkable tree, forming an excellent mark to vessels bound up the bay; the southern point may be approached within a mile, but the other sides are shoal, a reef running off its northern point in the direction of the river. The coast between this island and Pelado is low river land with mangrove bushes, and mud flats dry from 2 to 4 miles off, with shoal water beyond.

The land North of these rivers is of some elevation. *Column Peak* and *Asses Ears*, about 12 miles North of Chiman River, and *Thumb Peak*, at the West extreme of the range, are conspicuous.

Chepo River extends some distance into the interior of the isthmus, having its source near the head of the Savannah River. The entrance is to the westward of Chepillo Island, through a 10-ft. channel, about 3 cables broad. Vessels should stand no nearer than 6 fathoms between Chepillo and Panama, on account of the shoal water.

PANAMA.

PANAMA is one of the "Gates of the Pacific," and from the very earliest times has held an important position in the connection between the Old World and the Pacific. For within a year of the discovery of the great ocean a town was established in its vicinity.* During the Spanish occupation of these regions, it was periodically the scene of much activity, as the plate-fleet from Lima, with numerous merchant vessels with goods and treasure, came every three years for their transport across the isthmus to Porto-Bello. This continued, more or less, to the downfall of the Spanish power in America, but was also seriously affected by the establishment of a regular commerce round Cape Horn. With the growth of trans-oceanic steam navigation it began again to revive, but the gold diggings in California suddenly brought it into prosperity, which was wonderfully enhanced by the completion of the railroad in 1855.

* "Nata, on the West side of the Bay of Panama, was the first town built by the Spaniards on the coast of the South Sea. It was founded in 1517. The following year they established themselves at Panama." - *Herrera, Historia de las Indias Occidentales*, dec. 2, lib. iv, chap. i.

The site of Panama has been once changed. Where the old city stood, which is about 4 miles N.E. of the present situation, was already, when the Spaniards first reached it in 1515, occupied by an Indian population, attracted to it by the abundance of fish on the coast, and who are said to have named it "Panama" from this circumstance, the word signifying much fish. They were, however, speedily dispossessed, and even so early as in 1521, the title and privileges of a city were conferred on the Spanish town by the Emperor Charles the Fifth. In the year 1670 it was sacked and reduced to ashes by the buccaneer Morgan; and it was only after this built where it now stands. Its present position is on a tongue of land, shaped nearly like a spear head, extending a considerable distance out to sea, and gradually swelling towards the middle. The old site is now quite deserted, but is well marked by a tower.

Immediately about Panama, East along the coast, and N.W. from it, the land is low and flat, but West and N.E. the mountains approach it closely; and from a hill called *Cerro Ancon*, about a mile West from the city, and 540 ft. high, an excellent bird's-eye view is obtained of the whole adjoining country, including the city, the islands in the bay, the neighbouring plantations, the mountains of Veragua, the Pearl Islands, the flat country towards Chagres, the elevated chain between Porto-Bello and Panama, the Rio Grande, the low land along the coast towards the Pacora and Chepo, Panama Vieja, &c., all which come successively under review, and together constitute a landscape beyond measure beautiful.

The city consists of two parts, the city proper of San Felipe, occupying the peninsula, and the suburb of Santa Ana on the isthmus. It contained a population of 25,000 in 1881, 5,000 being foreigners, who form the business portion. It has an imposing appearance from the sea, and is lighted with gas. There is a fine cathedral, built about two centuries ago, and lately repaired and restored.

Panama affords the usual supplies which are to be obtained in tropical regions, but are generally dear; provisions of excellent quality may, however, be obtained from the United States by ships requiring them; and, when time will admit of it, getting such from the States is far preferable to purchasing in the markets of Colon or Panama.

Water can be obtained at Panama from the tank of the United States' mail steamers; but it is cheaper at Taboga, where it may be purchased at 2 dollars a ton. Coal* may be bought here at times from the mail companies, but it is generally dear. The cost of coal imported into Panama by way of Cape Horn being 16 dollars per ton, and by the railroad 15 dollars. Consuls of all nations reside at Panama.

In 1881, 178 vessels, with a total tonnage of 213,845, entered this port, of which 68, tonnage 96,407, were British; this is exclusive of the regular British

* Some coal beds are reported to exist on the banks of the River Indio, lying between Aspinwall and Panama, which may become of importance.

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and American steamers, which amounted to 124 in number, and 203,986 tonnage. The cargoes were principally for transit across the isthmus to Colon, the prosperity of Panama being dependent on the traffic.

On board ship Panama is by far the most healthy place on the coast of Central America. Vessels of war have remained here many months at a time, their crews continuing in a healthy state, excepting those men who had the will and opportunity to indulge in the vile spirit (*aguardiente*) of the country, which is cheap and easily procured. The yellow fever that existed at the Morro of Taboga in the early part of 1859 was confined to that spot, and, with few exceptions, the victims to it were men of drunken habits, and for this reason commanders should avoid giving liberty to their crews at Panama.

The Railway was commenced in January, 1850, and finished on January 28, 1855, under the able superintendence of Colonel G. M. Totten. Its total length is 45 miles, 3,020 ft.; it runs on the right or easterly bank of the Chagres from the Atlantic terminus, as far as Barbacons, whence it crosses the river by a wrought-iron bridge, 625 feet long, in six spans. This is exactly midway between the two ends. The highest point is $37\frac{1}{2}$ miles from the Atlantic, and 263 ft. above the mean sea level. The total expenditure on the railway was 7,407,553 dollars—about £1,500,000 sterling. The fare across the isthmus is (or was) £5 4s. 2d. sterling, or 2s. $2\frac{1}{2}$ d. a mile; only one class, one of the dearest travelling roads in the world. The time occupied is $4\frac{1}{2}$ hours. The northern terminus, Aspinwall, or Colon, as it is termed in England, is a busy, thriving New England town, in great contrast to the Spanish Pacific terminus. The Panama Station is to the eastward of the city, and is connected with an iron pier, 450 ft. long, up to which the smaller steamers come for the transport of passengers and merchandise between the shore and the ocean steamers at Perico and Flamenco. About 20,000 passengers a year pass across by the railway, the number in 1879 being 23,729. A longer pier and docks are very much wanted at Panama.

A fixed red light is shown from the railway wharf a quarter of a mile northward of the city.

The Panama Canal.—On May 29th, 1879, the Inter-oceanic Canal Congress, assembled at Paris, decided that the most feasible of the seven proposed routes for a ship canal to connect the Atlantic and Pacific Oceans was that across the Isthmus of Panama, between Limon Bay and Panama, as surveyed by MM. Wyse and Reclus. Under the auspices of M. de Lesseps, the projector of the Suez Canal, a public company was formed to carry this design into effect at an estimated cost of about £24,000,000, including the purchase of the railway, and it was expected that it would be open for the passage of vessels in 1886; but from the progress already made it seems impossible that this can be realised.

The canal leaves Limon Bay a little North of Manzanillo, and here some large harbour works are to be constructed at the mouth of the River Chagres,

the course of which the canal will follow for about 4 miles. Thence it follows nearly the line of the railway, debouching into the Pacific at Perico, close to Panama, where it is to be widened to form a harbour. The total length will be about $45\frac{1}{2}$ miles, with a depth of 27 ft. 10 ins., and a width varying from 73 ft. in hard rock, to 188 ft. in soft earth, with sidings at intervals for the passage of vessels. About 100,000,000 cubic yards of earth and rock will have to be removed; the summit ridge is 287 ft. above the mean sea-level.

Among the many great difficulties the engineers will have to contend with, besides the climate, are the great bodies of water brought down in the rainy season by the Chagres River and the Rio Grande, and other streams, the route of the canal crossing and re-crossing these rivers. To obviate these floods it is proposed to construct canals to carry the water off, and also to form a large reservoir in the upper valley of the Chagres. The range of tide is also about 20 ft. higher at Panama than at Colon, which will much interfere with the project of a canal free from locks, a difficulty it is proposed to overcome by establishing large lock chambers at the Panama end.

Petillo Point, $1\frac{1}{2}$ mile to the N.E. of Panama, is a black rocky promontory with two small hills over it; rocky ledges extend from this point for $1\frac{1}{2}$ cable, and off their extreme a depth of 10 ft. may be found. A great portion of the bay, between this point and Panama, is dry at low water springs, yet at its entrance there is a depth of 8 ft. It is termed *El puerto*, or port of Panama, and it is here that most of the minor trade of the gulf is carried on by means of bongos, large canoes made from trees of such dimensions that some of them formed from a single trunk have measured 12 tons. *Buey Point*, only seen after half-ebb, forms the southern horn of this bay; the long rocky ledges extend $3\frac{1}{2}$ cables from the N.E. bastion, 5 cables from the S.E. bastion in an easterly and $2\frac{1}{2}$ cables in a southerly direction, forming a bay southward of Buey Point, in which is easy landing after half-flood, on a sandy beach in front of the Monk's gate. The general landing, however, is round Buey Point, at the market place on the northern side of the town. These ledges around the city, composed of rock with sand patches between, although now irksome and often dangerous to boats, afford every facility for erecting substantial piers and improving the port.

The S.W. part of Panama Road is embarrassed by rocks and shoals. Although these dangers are mostly above water, yet this part of the Bay of Panama should be avoided.

Perico and Flamenco, with the outlying rock of *San José*, are a group of islands forming the South side of Panama Road. *Ileña* and *Culebra*, the western and southern parts of Perico, are connected with it by an isthmus of beach and rocks; but at high water these present the appearance of three islands. Perico is the head-quarters of the United States mail steamers, the bay on its northern side forming a convenient anchorage, while on the isthmus, which is sandy on that side, steamers of 2,500 tons have been easily beached. Vessels using this anchorage after passing the island of Flamenco should

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keep close round the North end of Perico, and anchor when the isthmus opens. Large vessels drawing over 20 ft. may coal at Perico by passing West of the group at half-tide, with Ancon Hill (which on that bearing makes like a cone), just open of Ileñaio, N.N.W.; pass about a cable's length from Ileñaio, and anchor off its N.W. end in 24 ft., when Perico opens. In both cases attention must be paid to the time of tide.

Danaide Rocks, a patch of conical rocks on the eastern ridge of the road, with only 15 to 18 ft. on them, surrounded by $3\frac{1}{2}$ and 4 fathoms, lie E. by S. $2\frac{1}{2}$ miles from the S.E. bastion. These rocks are awkwardly placed, lying in the track of vessels standing for the anchorage, keeping their luff with the land breeze. It is a favourite fishing place, and vessels should avoid canoes seen in that vicinity, as they are probably fishing on the rocks. **Sulphur Rocks**, a dangerous reef, one mile to the N.W. of the Danaide, have a rock awash in their centre. **Knocker and Taboga Rocks** are two sunken rocks, with only 6 ft. water on them; the former has a red buoy, with *staff and flag* on it, and lies nearly one mile E. $\frac{1}{2}$ N. from the S.E. bastion; the latter lies a little more than 2 cables to the S.W. of the buoy, with 16 ft. water between and 12 ft. inshore of them, but no stranger should attempt to pass West of the Knocker Buoy.

Tides.—It is high water, on full and change, in Panama, at $3^h 23^m$; springs rise from 15 to 22 ft., and neaps from 10 to 16 ft. The ebb sets South from 1 to $1\frac{1}{2}$ mile an hour, and is stronger than the flood which runs to the N.W.

Directions.—Sailing vessels bound to Panama should endeavour to get within 3 or 4 miles of Chepillo Island, especially between December and June, and so have all the advantages of the prevailing northerly wind. From this point Ancon Hill will be seen, and should be kept a little on the port bow, as the wind hauls to the westward on approaching Panama. Vessels drawing over 18 ft. should pass South of Danaide Rocks, by not bringing San José Rock on with the West point of Taboga S.W. by S. $\frac{1}{2}$ S. until the cathedral towers are open to the eastward of Ancon. Having passed the Danaide the ship is fairly in the road and may anchor according to her draft; if not more than 18 ft. she may have Tortola just shut in by Ileñaio, bearing S.W. by S. $\frac{1}{2}$ S., and San José open East of Taboguilla, the eastern of the Taboga group. Larger vessels, drawing 24 ft., may come to the North of Perico, with the peak of Urava, the centre of the Taboga group, on with the East point of Flamenco, bearing South, taking care not to open Changarmi northward of Perico. If it is necessary to work up the road to an in-shore berth, tack on the western side just before Perico and Flamenco touch, and in standing to the eastward do not open San José of Taboga Island.

Vessels drawing 14 ft. may pass North of the Danaide and South of the Sulphur Rocks, with the Hermanos Rocks on with the right side of the peak between the Rivers Grande and Falfan, then San José on with the peak of Taboguilla bearing S. $\frac{1}{2}$ E., leads between Sulphur and Knocker Rocks, and they may anchor North of the buoy in 16 ft., keeping it between Perico and Flamenco, with Gabillan, a rocky peninsula West of the town, just shut in

by the S.E. bastion. During neap tides they may anchor more to the N.W.

Panama Road, although shoal, may be considered secure; the ground being muddy holds well. A sailor, resident in Panama for five years, remarks, that during that time there was no known case of a vessel being driven from her anchor; and with good ground tackle and proper precaution a vessel might lie there all the year round with one anchor down. Attention to the tides and soundings of the roadstead will enable a vessel to lie close in at times for the discharge of cargo.

TABOGA ISLAND, with those of *Urava* and *Taboguilla*, form a pleasant group of islands, about 4 miles long by 2 miles broad, lying 9 miles to the southward of Panama. Taboga, the highest and largest, 935 ft. above the sea, is well cultivated, with a considerable village on its N.E. side. To the northward of the village is the Morro of Taboga, a small hill, connected with the main island by a low, sandy isthmus, covered at high water. This place is the head-quarters of the Pacific Mail Company, who have here a steam factory and coal stores, also a gridiron, 300 ft. long (reported to be destroyed in 1877), on which H.M.S. *Magicienne*, a vessel of 1,255 tons, was repaired in 1858.

Vessels visit Taboga from Panama to procure water and supplies, both of which are more readily obtained than at the city. Water can be procured from the company's tank at 2 dollars per ton. The anchorage formed by the Morro is convenient, being about 3 cables from the shore in 10 fathoms, with the peak of *Urava* on with the high cliff at Taboga, and the church from S.W. $\frac{1}{2}$ S. to West. Vessels coaling at this island should avoid giving liberty to their crews on account of the fever.

Urava is a small, lofty island, separated from the S.E. point of Taboga by a narrow and shoal channel; off its southern extreme is the small islet of *Terapa*. *Taboguilla*, 710 ft. high, also well cultivated, with some islets off its S.W. extreme, forms the N.E. island of the group, with a wide and deep channel between it and *Urava*, in the centre of which is a rock, said to dry 4 ft. at low water springs, with 8 and 14 fathoms close to.

The Coast from Bruja Point to Chamé Point, a distance of 16 miles, forms a shoal bay, with several outlying banks and rocky islets, and vessels bound to Panama should keep near the islands of Taboga, and not approach this shore within the depth of 5 fathoms. About one mile to the N.E. of Vique Cove, which is 5 miles westward of Bruja Point, is a lofty treble-peaked hill, called *Cerro de Cabra*, forming a conspicuous object to vessels bound to Panama, and frequently mistaken for Taboga by those coming from the eastward.

Melones Island is a small rocky islet $2\frac{1}{2}$ miles to the N.W. of Taboga, with a rock above water, lying about half a mile to the northward of it. *Chamé Island*, with *Perique Rock*, are of a similar nature, situated about the same distance southward of Taboga. *Valladolid* is a large rock, nearly 2 miles to the S.W. of Chamé Island, with 9 and 10 fathoms close to it.

Chamé Bay, at the head of which is a small river of the same name, is nearly

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filled up by large banks, of which the largest is the Cabra Bank, lying in the middle, with Tabor Isle on it. On the southern side is Chamé Point, a singular, low, woody promontory jutting into the sea, $5\frac{1}{2}$ miles long by half a mile broad. Between this and Cabra Bank is a convenient harbour, 2 miles in length by about three-quarters of a mile in breadth, with from 3 to 8 fathoms water in it, and from 16 to 18 ft. close to the beach of Chamé Point. To the N.W. of the river is a high range called *Sierro Capéro*, and to the southward are the *Cerro Chamé*, a group of wooded hills.

Otoque and Bona, high and peaked, with *Estiva Island* and *Redondo Rock*, lying 6 miles to the S.E. of Chamé Point, form a group similar but somewhat smaller than *Taboga* and *Taboguilla*, being cultivated, and having a considerable village, called *La Goleta*, in the bay on the western side of Otoque. Anchorage, in from 10 to 14 fathoms, may be found in any part of this group, and all dangers are above water.

PARITA BAY, large and open to the eastward, is nearly 20 miles across, lying 45 miles to the S.W. of Chamé Point. The coast between is a continuous beach, called *Playa Grande*, in front of a low wooded bank. There is a depth of 4 to 5 fathoms at 2 miles off this beach, except S.E. by S. $\frac{1}{2}$ S. of *Cerro Chamé*, where there is only 4 fathoms nearly 7 miles from the land, and thence extending to Chamé Point. To avoid this, vessels from Parita Bay should steer so as to pass about 2 miles southward of Bona, when they may steer up the bay, inside but nearer the islands than the shore.

The mud flats are found again on the western side of Parita Bay; but at *Liso Point*, on the South side of the bay, the beach again commences, and extends as far as *Cape Mala*, 38 miles to the S.E.

Iguana Island, a little higher than the adjacent coast, and thus forming a conspicuous object, lies about 9 miles to the northward of *Cape Mala*, and 2 miles off shore. The island is steep-to, except at its South and East points, with 15 fathoms in the channel between it and the main. A reef is said to stretch to the N.E. of it.

CAPE MALA, which forms the western point of entrance to the Gulf of Panama, is a low but clifly point with outlying rocky ledges having deep water close to them. The land from the N.W. slopes gradually down to the sea at this point from a considerable distance, making the exact cape difficult to distinguish, unless the breakers are seen. On opening the gulf round this a strong southerly set is generally experienced, especially in the dry season.

The **PROVINCE of VERAGUAS**, the western of the United States of Colombia, or New Granada, was but little known till the surveys of Capt. Kellett and Capt. Jas. Wood, in 1848-9, and Capt. de Rosencot in 1854-7, made us acquainted with its coasts. Of the interior we are still almost as ignorant as were the early historians of Columbus. The relative poverty of the region has never attracted any attention, or raised any commercial prospect.

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ducts. The native population, chiefly Indian, does not exceed 50,000 in number. Some of these are occupied during part of the year in collecting pearls and pearl-oyster shells, and also tortoise-shells, for which one or two vessels annually visit the different islands and harbours, of which that of David is the chief, the town being the capital of the province.

In front of the coast is an archipelago, or rather range of islands, running generally parallel with it, and leaving a channel, 10 or 12 miles broad, within the four groups which they form. The coast itself abounds in excellent and spacious harbours, and throughout landing is easy and safe. There are few barred rivers or outlying shoals, but then there is little more than the vast primeval forest to visit.

Los Frailes are two remarkable rocks or islets, the southern one of which is $11\frac{3}{4}$ miles S.W. $\frac{1}{2}$ S. from Cape Mala. They are $2\frac{1}{2}$ miles apart, N.W. by N. $\frac{1}{2}$ N. and S.E. by S. $\frac{1}{2}$ S., and are bold-to, with the exception of a reef extending about a cable from the N.W. point of the southern rock. They are a good mark for approaching Cape Mala. In leaving the Bay of Panama, the cape should not be approached too closely, as the current shifts from its easterly direction to the S.W. outside it.

The coast trends to W.S.W. from Cape Mala, and at $13\frac{1}{2}$ miles distant is the small island of *Benado* or *Venado*, lying off a projecting point named *Raia*. Not far from this there is a commodious creek, according to native report, or river, accessible for vessels of any draught, having 10 or 12 fathoms depth, and affording a supply of fresh water. The coast beyond this trends to S.W. for 16 miles to Puercos Point, and then 27 miles W. by S., terminating in Point Mariato, from which it bears to the northward. The only outlying dangers are a shoal of 18 ft., lying $1\frac{1}{2}$ mile off shore, at 2 miles E. by N. of Point Puercos; and another reef, of some extent, a mile off shore, and 4 miles W.S.W. of Point Puercos. The rest of the coast is quite bold-to.

Mariato Point is bold and bold-to, its S.W. extremity being in lat. $7^{\circ} 12' N.$, long. $80^{\circ} 52' 30'' W.$ At 5 miles N.W. by W. from it is a small wooded island, *Naranjas*, which has deep water close outside it. Mariato Point is a good landfall for vessels from the westward bound to Panama; the southerly current setting out of the gulf will be avoided by keeping under the land eastward of it.

The **BAY** of **MONTIJO**, 23 miles northward of Point Mariato, is an extensive gulf, in front of which is the long and narrow island of *Cebaco*, which nearly encloses it to the southward, and the channel to the westward of it is partly occupied by the island *Gobernador*. The bay is thus completely sheltered, but unfortunately the depths inside are so irregular, that it is useful only to vessels of small draught. There is a deep channel to the East of *Cebaco*, which shoals suddenly from 12 fathoms to 6, and then to $3\frac{3}{4}$ fathoms, at 4 miles North of the East point of *Cebaco*. Keep along the East side of the bay, taking care to avoid the rock *San Juan*, distant about $1\frac{1}{2}$ mile from

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the land, and also some others farther to the North, and you may thus reach *Leones Island*, at the head of the bay. There is another channel to the West of Cebaco, passing on either side of Gobernador, but that between Gobernador and *Brava Point*, on the North shore, is preferable, because the southern channel is narrower, and the tidal stream through it much stronger. In this western entrance to the bay a vessel should not go farther in than in 4 fathoms. There is good shelter for vessels of light draught under the West shore of the bay, which is easily reached. It is necessary to be very careful with the lead, on account of the steep banks which extend throughout the bay as far as *Leones Island*.

COIBA or Quibo, surveyed by Capt. James Wood, R.N., is the largest of the islands off this coast, and is 60 miles in circumference. The interior consists of fine plains covered with magnificent forests, as yet untouched. In the fine season there are abundant streams, and there are numerous anchorages around its shores, but it possesses no harbour, properly so called. It was a favourite resort in early times, as vessels coming to its bays were free from molestation, and its fine timber was much prized.

The western coast of Coiba is clear of danger, but there is a shoal nearly a mile in breadth against its southern extremity; and outside of this, $2\frac{1}{2}$ miles off the shore, is a dangerous 6-foot shoal, called *Hill Rock*, which bears E. $\frac{3}{4}$ N. $5\frac{1}{2}$ miles from David Point, the East end of Ilicaron, and the same distance S.W. by W. from *Negada Point*, the S.E. end of Coiba. There are several other rocks hereabout, but they are above water. *Hermosa Point* is the N.W. extreme of the island, and has deep water close outside the rocks and islets off it. To the East of it is an open bay, *Hermosa Bay*, with a sandy beach. *Baltasar Head* is the North point of Coiba, and is $10\frac{1}{2}$ miles N.E. $\frac{1}{4}$ N. of *Hermosa Point*.

Damas Bay, on the eastern side of Coiba, and 6 miles N.W. from its S.E. point, is the principal anchorage. It is about $6\frac{1}{2}$ miles wide, and has a broad sandy flat at its head, through which the waters of a small stream, the *Rio San Juan*, flow. There is good anchorage in any part of the bay, the depths gradually decreasing from 30 fathoms, between the two outer points, to 10 or 12 fathoms, within a quarter of a mile of the sandy flats, which, as the tide rises and falls about 6 ft., must be guarded against. There is a narrow inlet between the reefs extending nearly a mile from the South side of the bay, with 6 and 7 fathoms water, which might, with care, afford protection from the S.E.

The island, as above said, is covered with a dense and tangled tropical vegetation, the undisturbed abode of birds, reptiles, and wild beasts. A visit to the land should therefore be conducted with caution.

In former times, when the system of reprisals against the Spaniards was so vigorously pursued by the buccaneers and ships of war sent by England, as related by Dampier, Woodes Rogers, Lord Anson, and others, Quibo was a

point of very considerable importance, as affording means of shelter, and also water, near to the principal field of action against the Spanish galleons. In the account of Commodore Anson's voyage, the whole island is described to be of a very moderate height, excepting one part of it (near the N.E. end), and its surface covered with a continual wood, which preserves its verdure all the year round. Tigers, deer, venomous snakes, monkeys, and iguanas exist upon the island, a statement repeated by Capt. Colnett (1794). In the surrounding sea, alligators, sharks, sea-snakes, and the gigantic ray abound. Pearl oysters, which attracted the pearl fishers from Panama, were also to be gathered from the surrounding rocks, and the huts of these men and heaps of shells still existed at Colnett's visit. On the N.E. part of the island, Anson describes a cascade of very great natural beauty, a river of clear water, about 40 yards wide, rolling down a rocky declivity of nearly 150 yards in length.

Capt. Colnett, who was here in February, 1794, anchored in Damas Bay (Port de Dames) in 19 fathoms, the North point of the bay in a line with the North point of Cebaco Isle, bearing N.N.E., the watering place N.W., and the South point of Quibo S.E. by S. He says:—"Quibo is the most commodious place for cruisers of any I had seen in these seas, as all parts of it furnish plenty of wood and water. The rivulet from whence we collected our stock was about 12 ft. in breadth, and we might have got timber for any purpose for which it could have been wanted. There are trees of the cedar kind of a sufficient size to form masts of a ship of the first rate, and of the quality which the Spaniards, in their dockyards, use for every purpose of shipbuilding, making masts, &c. A vessel may lay so near the shore as to haul off its water; but the time of anchoring must be considered, as the flats run off a long way, and it is possible to be deceived in the distance. The high water, by my calculation, is at half-past three o'clock. At full and change the flood comes from the North, and returns the same way, flowing 7 hours, and ebbing 5, and the perpendicular rise of the tide 2 fathoms."

Hicaron, which lies off the S.W. side of Coiba, 4 miles distant, is of a triangular form, $3\frac{3}{4}$ miles long, and well wooded. Its highest point, 830 ft., is on the East side, an eminence that commands a prospect all over the adjacent islands, and the coast beyond. Off its South point is *Hicarita*, a small islet, covered with cocoa-nut trees. The channel between Hicaron and Coiba is of very irregular depth, but is safe and practicable.

Rancheria, or *Quibito*, is a small island $1\frac{1}{2}$ mile long, and $1\frac{1}{4}$ mile off the N.E. point of Coiba. To the S.S.E. of it is a sandy beach, where there is good anchorage, sheltered by a round and high islet. Wood and water are easily procured. A Frenchman formed a small settlement here on the South side. The channel between Coiba and Quibito is rocky and uneven, but is apparently safe.

Afuera, or *Canal Island*, 4 miles N.E. $\frac{1}{2}$ E. of *Rancheria*, is about midway between the North point of Coiba and the shore. It may be passed on either

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side, the only danger around it being a reef against its S.E. side, which has a black rock, always uncovered at its outer edge, 2 cables' lengths from the shore. The islet *Afuera* nearly touches *Afuera* on the North.

BAHIA HONDA, "deep bay," is well named, and is an excellent natural harbour. It is 22 miles N.W. by W. from the West end of Cebaco, and opposite the North point of Coiba. Should that island ever rise into importance, Bahia Honda must be its port. It is easy of access, perfectly sheltered, wood and water abundant, and easily procured, and is so safe that a vessel may be hove down, or any repairs done, without fear or hazard.

It was surveyed by Sir Edward Belcher in the *Sulphur*, in 1839, and it was also examined in 1854 by Capt. de Rosencoeat, in the *Obligado*. Sir Edward Belcher says:—"On the 4th of March, 1839, we moved on to Bahia Honda; another of our stations in 1837. Here we fell in with a few Chiriqui Indians, sent to clear the land, but they were also very much afraid of having any dealings with us.

"We found this to be a most capacious, safe, and convenient harbour, completely landlocked, and perfectly adapted for refit, heaving out, &c., there being no tide or current. Water was in abundance at the beach, and nothing wanting but a town and civilization to render it a favourite resort; timber of every kind, and the best abundant. The islands at its entrance are beautifully adapted for defence, with but trivial labour. At this port we collected a large stock of parasitic plants in full flower, which continued to decorate my cabin for some time, until forwarded to England, where they arrived in 42 days in good order."

Sentinela Island, which forms the southern point of the entrance, is in lat. $7^{\circ} 42' 45''$ N., long. $81^{\circ} 32'$ W. It is small, and some rocks lie around it to the extent of about a cable. Capt. de Rosencoeat also shows a detached reef, about 2 cables to the N.E. of it, which is not marked on Sir Edward Belcher's survey. A smaller islet, *Cono*, lies a short distance South of it, and both are separated by a narrow rocky channel from *Cape Jabali*. *Guarida Point* is the North point of the entrance, nearly a mile North of *Sentinela*, and the depth between is tolerably even all across, about 20 to 23 fathoms. This depth gradually decreases within the bay to 12 and 13 fathoms $1\frac{1}{2}$ mile within the entrance up to *Talon Island*, the highest point of which is about 120 ft. high, and bears N.E. by E. from the entrance. *Talon* is rather more than half a mile long; off its N.W. point is a small island, *Pueril*; and off its South point is another, *Espuela*. These separate Bahia Honda into two anchorages, *Chinche Bay* to the westward, and *Legamo Bay* to the eastward, the former being more extensive. *Talon* has but a shallow channel to the North of it. The whole extent of the inner bay is about 3 miles from West to East. At 2 miles westward of the entrance is *Medidor Island*, and off the South end of this is *Trucha*, or *Pacora*, a smaller island, bold-to on the South side. Capt. de Rosencoeat gives the following instructions for entering:—

In coming to this harbour, after having made out Afuera in mid-channel off it, the island Medidor will be seen. It is of moderate height, and must be steered for until the small islet, Pacora or Trucha, is made out, lying close to the South point of Medidor. There is a passage on either side of this islet, but it is best to leave it to port, as the northern channel is narrowed by the rocks off Medidor. Then steer for Guarida Point, or rather more to southward. The entrance to the bay is easy, although it does not make out well at a distance. To the right, close in-shore, is *Sentinela Islet*, which should be avoided on account of the rocks which surround it; and to the left is Point Guarida, which is quite clear, and may be ranged close-to. When past this point, bear up to port, and make for a round wooded islet, *Chinche*, lying in the N.N.W. part of the bay, and anchor in 11 to 14 fathoms, muddy bottom, sheltered from every wind.

The bay is separated into two parts by an island named *Talon*, to the West of the anchorage. The only population of the bay consisted of a few Indian families on this island, from whom eggs, fowls, cocoa-nuts, and bananas, were procured at a cheap rate. They are also the most expert turtle catchers, and will furnish a large quantity daily. Fish also is abundant. To the eastward of the island the extensive mud-banks, which uncover at low water, leave only a narrow space for anchorage in $5\frac{1}{2}$ fathoms, but this is unimportant, as there is nothing to induce a vessel to come into this part of the bay. The only dangers to point out are a rocky reef a little above the line joining Point Penot and Pueril Islet, at $1\frac{1}{2}$ cable from the last; and another reef at the same distance North of Guarida Point, on which there is only 8 ft. water. The *Obligado's* anchorage was with Point Guarida S. 40° W., *Sentinela Islet* S. 14° W., *Espuela Islet*, S. 83° E., *Chinche Islet*, West point N. 15° W. Capt. de Rosencat made the position of this anchorage of the *Obligado*, opposite Pueril, to be in lat. $7^{\circ} 44' 52''$ N., long. $81^{\circ} 31' 0''$ W. High water, on full and change, at $3^h 30^m$; tides rise 12 feet.

Water is abundant, and there is a stream, the *Arroyo del Cobre*, in the S.E. part of the harbour, which can be ascended high enough in a boat to get good water; but the most convenient place is to the E.S.E. of the above anchorage, where there are two streams, which, with a hose, will fill the casks rapidly. Wood is abundant everywhere, the forests are magnificent.

Leaving Bahia Honda is as easy as its access. Keep on the side around Point Guarida, avoiding *Sentinela Islet*. The best time is in the morning, when the winds which precede the sea breeze come from East to N.E. These are sometimes so light that you must tow out by your boats. Having doubled Point Guarida, steer for Trucha, leaving it to starboard, the same with Medidor, and not attempting to pass through the narrow and rocky channel which separates the latter from the land.

The COAST beyond Bahia Honda is a succession of bays of different extent, among which the three principal are *Monita*, *del Rosario*, and *del Pajaro*.

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The first is to the North of *Point Ventana*, a projection of which the extremity opposite Medidor Island is called *Punta Roble*. The bay itself takes its name from a wooded islet on its northern part near the land. It is clean, but affords no shelter against westerly winds.

Bahia del Rosario is separated from the last by *Point Gorda*, the name of which is expressive of its massive character. It is recognisable by a small round islet in the middle of the bay, about a mile from land, called the *Muela*, or *Caballo*. The bay is included between Gorda Point and the *Punta del Muerto*, which terminates in an isolated pointed hill; between these points is that of Rosario, which gives name to the bay, and separating it into two parts, the southern of which is called *Pivay Bay*. At the head of each bay a stream debouches, but the anchorage is open to West and S.W., and can only be used in the fine season. The third, or *Pajaro Bay*, is 9 miles from Medidor Island, and has 16 to 18 fathoms water. In each of the bays a few Indian families are found, who live by fishing and hunting.

The navigation along the coast thus far is quite safe close in; but to the North of *Pajaros Point*, the North limit of the bay, a long sandy shelf commences, the *Playa Brava*, which fronts the coast for 9 or 10 miles, and off the South end of which, at 2 miles from shore, is only 6 ft. water, a bank apparently formed by the deposits brought down by the *Rio Lavenia*. At the North end of this bank is the mouth of the *Rio Tavasera*, which has no bar. *Negrito Bluff* is on the West side of the entrance.

The *Contreras* are two islets, with numerous rocks and islets, lying 10 miles off this coast. The northern island is called *Brincanco*, and the southern *Pajaros*. They are $3\frac{1}{2}$ miles apart, and the southern island is 9 miles N. by W. of Coiba. There is no good anchorage around them. The *Obligado* anchored on the North side of Brincanco, off a small bay resorted to by the fishermen for turtle and pearl oysters; the bottom coarse gravel, and very bad holding ground. The islands are uninhabited. They may be approached without fear, the depths being 30 to 40 fathoms near them. The only known danger is a moderately high rock, the *Farallon de Prosper*, which stands like a black tower, about 2 miles S. by E. from the South point of the Pajaros. It was so named from the wreck of a French ship *Le Prosper*, which was drifted on to it in a calm. Vessels should not pass between them, on account of several rocky patches.

PUEBLO NUEVO was surveyed by Sir Edward Belcher, in the *Sulphur*. In his book he says:—"Our first halt was Pueblo Nuevo, in March, 1839, at the mouth of the Santiago, or Pueblo Nuevo, at the island called by us Magnetic Island, in March, 1837. Here we recommenced our survey of this river, following its branches up for some distance. The river takes its name from a small village, situated on the River Santiago, where the Spaniards probably first appointed the seat of government. The port is formed by a neck or island about 3 miles in length, which affords good anchorage for vessels of any class.

Three larger streams discharge themselves into the main basin at the western end of this island, where the apparent great entrance is situated, but so studded with rocks and shoals as to be unnavigable for anything larger than boats. It is, in fact, an extensive archipelago, as most of the regions towards the Chiriqui territory will be found to be on future examination.

"A plan was made, which will prove interesting to those who may visit this port, for refuge or refit; but water cannot be procured in any quantity. It may probably be found by digging wells. The natives generally appeared alarmed at our presence, nor could we induce them to bring off supplies. Had our visit been prolonged, no doubt this would have been dispelled; as, after we fell in with a negro who understood English, they appeared anxious to sell pigs, poultry, &c.

"Their principal article of trade is the sarsaparilla, that of this neighbourhood being esteemed of superior quality. The stream runs fresh at some miles up, but we did not either meet it or succeed in finding the town. Sugar-cane of good quality was offered; and tortoise-shell, one of their articles of trade, can be procured at the season."

Sir Edward Belcher's survey was published 10 years later, and the place was again surveyed in 1854 by Capt. de Rosencat, who in his chart or directions takes no notice whatever of his English predecessor, as is indeed the case throughout the French work. It would seem to have been scarcely necessary for the two nations to have surveyed this uncommercial region twice within so few years. What follows is derived from Capt. de Rosencat's pamphlet, adapting it to Sir Edward Belcher's survey.

From whatever direction Pueblo Nuevo is approached, it is easily made out by the two hills or Morros, the *Cayado Hills*, 300 and 400 ft. high, on the South side of the entrance, which, at a distance, make like two islands. A conspicuous sugarloaf hill, about 5 miles North of the entrance, is also a good mark, as it stands alone, and is 550 ft. high. On a nearer view, two low and wooded islands come in sight, *Silva de Afuera*, the *Magnetic Island* of Sir Edward Belcher, and *Silva de Tierra*, or *Silla Island*, which lie E. by N. and W. by S., nearly 3 miles apart, in a line with the entrance of the bay.

The entrance of the river is formed by a low mangrove island, *Insolita*, as before stated, which Capt. de Rosencat calls *Porcada*. It is about 4 miles long N.W. and S.E., and has a former channel to the river to the N.W. of it, but this is now only passable by boats. The southern entrance is close around Cape Cayado, between that point and a spit projecting a mile to the W.S.W. from *Belitre Point*, the South extreme of *Porcada*, and which, as it uncovers at low water, acts as a breakwater to the channel. Cape Cayado is so named from its supposed resemblance to the form of a bishop's pastoral staff, or a shepherd's crook, and has 8 to 10 fathoms close up to its base. The channel here is not more than $2\frac{1}{2}$ cables wide, but the channel is straight, running nearly East and West, with 6 to 10 fathoms throughout.

It is necessary to have a commanding sea breeze and the flood tide to enter. Being a quarter of a mile due West of Cape Cayado, you will see a small round islet or rock in the middle of the inner basin, the *Intrusa* of Belcher, or the *Perdono* of de Rosencoot. Keep close to the South cape, and steer for this islet, and proceed until it comes on with Belitre Point, the South cape of Porcada, when you may anchor in 7 to 9 fathoms, fine sandy bottom. Perhaps it is best to enter with the first of the flood, as then the edges of the banks are plainly seen, which is not the case so well near high water. You may pass quite close to *Intrusa*; but the banks to the eastward are very irregular in depth, so that vessels drawing more than 17 or 18 ft. should be cautious.

The resident Indians say that the westerly winds, which are frequent between June and October, send in a heavy sea to the inner anchorage; but in this case shelter may be found in the river itself within Belitre Point, and, if necessary, as high up as *Payo* or *Conejo Island*, which is a mile N.N.E. of *Intrusa*, to reach which, you must pass to the North of that island.

The only dangers here, beside the bank at the entrance, are the mud banks in the southern part of the inner bay; another bank to the southward of *Payo*, and some rocks scattered on the bank abreast of the channel East of *Payo*, on which lies the small islet *Herron*, off the mouth of the river, or *Arroyo Tinto*.

Sir Edward Belcher places the Observation rock off the South side of Magnetic Island, or *Silva de Afuera*, in lat. $8^{\circ} 4' 39''$ N., long. $81^{\circ} 45' 30''$, but it is now considered to be in long. $81^{\circ} 48'$. Capt. de Rosencoot makes *Perdono* or *Intrusa Island* to be in $8^{\circ} 4' 54''$ N., long. $81^{\circ} 43' 0''$. It is high water, on full and change, at $3^h 10^m$ or $3^h 44^m$; rise from 9 to 12 ft.

Good water may be procured from a brook which falls into the small bay on the East side of Cape Cayado. The bay is inhabited by a few Indians in ranchos or huts, scattered along the beach. Some eggs, fowls, vegetables, and tropical fruits may be obtained. There are a number of small villages on the numerous affluents which fall into the river, but by far the largest is on the stream which gives it its name. At one time it was on an eminence only 2 miles from the *Boea Brava*, and was then called *Los Remedios*,—a name still applied to the place, which is 15 miles from the harbour. The passage up to it is intricate, and can only be found by native guidance. This "pueblo nuevo," or new town, has about 2,000 inhabitants, among which are a small number of Europeans, and provisions may be procured here. On all the islands and all visits to the shore, be exceedingly cautious against a most venomous species of serpent, which is very numerous, and whose bite is fatal.

Leaving Pueblo Nuevo is as easy as the entrance. It is best to have the land-breeze, and start a little before the end of the flood-tide. Having got beyond Cape Cayado, pass on to the southward of *Silva de Tierra*, and then take any route at pleasure. It is not advisable to pass inside *Silva de Tierra*, on account of a long spit of sand and rocks which extends from its North side.

North Pacific.

From the northern entrance before described, on the N.W. side of which is the low island *Espartal*, the coast trends to W. by N. for 21 miles, for the first 18 of which it is composed of narrow sandy beach, behind which is a line of forest, intersected here and there by the mouth of a river, which are recognisable afar off by the whitened and bare trunks of the mangroves. About a dozen miles inland is a range of hills, the last steps of the Pacific Cordillera, between which and the sea is a wooded plain. Beyond the above limits the hills approach the sea coast, which is otherwise quite safe to approach by the lead at a distance of 2 or 3 miles; there are some conspicuous red cliffs hereabout. The coast then turns abruptly from the San Lorenzo River to S.S.W. for 4 miles, forming a peninsula, off the S.E. point of which are the *Benado Isles*, which consist of one larger island near the point, and three smaller on one bank farther to the eastward. *Point Ojo de De Rosencot* (the *El Juco Point* of Capt. Wood), 3 miles West of the eastern Benado Islands, is the southwestern extremity of a peninsula which forms the eastern limit of Chiriqui Bay.

SECAS ISLANDS lie nearly on the meridian of 82° W. at 14 miles off the coast. The group consists of three principal islands, with numerous rocks and islets, one of which is 5 miles northward of their southern edge. With one exception the islands are quite safe, and they will afford shelter to a small vessel, and several of them are accessible, but there is no fresh water, as their name indicates. A vessel becalmed or at nightfall might seek shelter safely here when approaching David Bay in 12 fathoms, sandy bottom. At $2\frac{1}{2}$ miles N.E. by E. of the South end of the largest island is a *rock awash* at high water, but which is quite uncovered at low water, called *La Bruja*. There is a widespread tradition that at the period of the Spanish conquest, some Indian refugees buried some treasures on the northernmost part of the largest island, and this is in some measure borne out by the discovery of several ancient implements and other objects.

The Chiriqui coast, as this part is called by Capt. de Rosencot, is fronted by a large group of islands, and with the numerous streams to the North of them, forming an intricate archipelago, to the North of which, by a tortuous channel, the approaches to the town or city of David are found. The various islands and channels are so united by almost a continuous shoal, nearly 20 miles in extent from East to West, that, as above said, the only safe access is from the eastern end of the labyrinth.*—*Captain Wood*.

* The charts and directions for this part afford an example of what should be avoided. The island was well and carefully surveyed by Commander Wood in 1818, but this fine chart, with all its details, was not published till *thirteen years* later. In the mean time the French officers in the *Obligado*, commanded by Capt. Roux de Rosencot, also surveyed it, in 1854. The French survey has not the slightest allusion to its predecessor, and these two charts differ entirely in their nomenclature, &c., so that Capt. de Rosencot's directions are

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CHIRIQUI or **DAVID BAY** lies between El Juco Point and *Palenque Island*, $5\frac{1}{2}$ miles asunder East and West. Off Juco or Ojo Point is an isolated rock known by a clump of trees on its summit, and the point may also be known by two small islands, *Silla* or *Ensellada*, which from the South have the appearance of a saddle, as the name indicates.

Viuda Rock (the Widow) lies $3\frac{1}{2}$ miles to the southward of El Juco, and is a large flat rock, with a reef extending half a mile to the E.S.E. It is quite steep-to on all sides, having from 8 to 13 fathoms all around it, and may be seen at a distance by day, as the sea breaks heavily upon it. At low water four pinnacles are uncovered, one only being visible at high water.

A *sunken rock* is said by the natives to lie rather to the West of the line joining the West end of Viuda Rock and the Secas, about midway between, which would place it about 5 miles S.E. from the Viuda. It has been unsuccessfully sought for, but it was said to show but very rarely.

In coming from the East, do not pass to the northward of the *Ensellada* or *Monitas Islands*, on account of the strong currents. Leave them on the starboard hand, ranging close to them if desired. Coming here from the southward, take care to avoid the Viuda, and when abreast of it to the West, steer for the *San José Islands*, a cluster of four wooded islets united by a reef. These are also safe, except a spit which runs off their East point. Guarding against this, also keep a good look-out for another insidious danger, *Buey Rock*. This rock is of small extent, lying in the middle of the bay, and uncovers at half tide, and does not show at all at high water and in fine weather; neither does the lead give any sign of its proximity, for the usual depth of 7 and 8 fathoms is found close up to it. It lies $1\frac{1}{4}$ mile N.E. $\frac{1}{2}$ E. from the summit of San José, and $3\frac{1}{2}$ miles W. by N. from the *Monitas* or *Ensellada*. There is good anchorage to the N.E. of this in the fine season, but during the period when the S.W. winds prevail, it will be better to get under the lee of San José Islands.

At the head of the bay is a line of islands running generally E.S.E. and W.N.W. According to Capt. de Rosencot their names are, going from East to West, *Monita* (this name is given by Capt. Wood to the outermost cluster), *Mona*, *Carey* (Carré of Wood), *Bajo Rayado*, *Saino*, and *Ventana*; to the North of the last is the East end of the larger island, *Brava*, extending 7 miles to the westward, and along the northern face of which is the channel leading to David. The bay within this line of islands is inaccessible to ships. But it is probable that there is shelter between the second and third islands West of El Juco Point, which is called the Plaza Grande. At the head of this bay is another called the *Ensenada de Chuchican* or *Chuchegal*, on the plains around

almost unintelligible when used with Capt. Wood's chart, which is quite sufficient of itself as a guide in this most unfrequented region. We have followed, in some degree, the French directions, giving Capt. Wood's names.

which are numerous herds of cattle, which can be purchased direct from the owners.

The *Boca Chica*, or entrance to the river, lies between Ventana and Saino. It may be known by some rocks on the extremity of the former, being pierced through by the sea at its base, so as to have the appearance of a window or ventana. The passage is very narrow, and in taking it keep close to Saino, and guard against *Lavandera Rock*, which is quite covered at high water, lying $1\frac{1}{2}$ cable off Ventana. The water is very shallow within the point, and is quite unadapted for sea-going vessels, and cannot be taken without a pilot. Within, the anchorage is called *El Pozo* (the well), and from this can be seen the outer houses of Boca Chica (or the *Puerto de San Lorenzo* of Captains Kellett and Wood). It consists of about a score of ranchos or huts, surrounded by orange trees and bananas. Fresh provisions, as butcher's meat, poultry, fruits, &c., can be bought here cheaply.

The watering-place is on the North shore of El Pozo, but it is not convenient, though the water is good. Capt. de Rosencat made the sandy bay on the South side of Saino in lat. $8^{\circ} 11' 52''$ N., long. $82^{\circ} 12' 8''$ W. The tides were regular, the greatest rise was 11 ft., the least 6 ft.; high water at $3^h 15^m$.

David is the chief town of the province of Chiriqui, and lies about 25 miles from the sea by the eastern channel, or 10 miles by the western one, and to go thither in a boat a pilot is indispensable on account of the intricacy of the channels. It stands in a fine plain, and is surrounded by cultivated lands, which extend as far as the extinct volcano of Chiriqui. The population is about 9,000, and it has a regular trade with Panama, sending thither by some small vessels pigs, poultry, eggs, vegetables, &c. The cattle are generally driven to the market.

The situation of David has some importance from the fact that it stands on the narrowest portion of the American isthmus, and on ascending the Chiriqui volcano both oceans can be seen at once. An ordinary cart road has been proposed as the modest substitute for a railway, which should lead from Almirante Bay on the Atlantic, a good harbour, to that just described. Another feature of importance is the existence of a *coal-field*, which extends nearly across. A portion taken from Muertos Island, near the entrance of the river, was analyzed by Professor Rogers, and gave good results.

Palenque Island lies off the South side of Isla Brava, on the West side of David Bay. The shoal water which limits the bay trends to the E.N.E. and W.S.W. from this island. Off its S.E. point is *Deer Island*, the S.W. point of which was made by Capt. Wood to lie in lat. $8^{\circ} 10' 13''$ N., long. $82^{\circ} 13' 40''$ W., but later authorities place it in long. $82^{\circ} 14' 50''$.

PARIDAS ISLANDS are a group at the western extremity of those described as lying parallel to the coast and the chain of mountains which runs through the isthmus. They consist of one large island, *Parida*, about 11 miles in circumference, at the West end; another, much smaller, *Bolano* or *Volano*,

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near the eastern part of the cluster, and a crowd of islets and rocks between the two. They are uninhabited, except during the season of the pearl fishery, when a few people come to them.

Parida is well wooded but not high, and is the only one of the group that affords water. According to Capt. de Rosencot, the only anchorage is at the N.E. end of the largest island, and is sheltered by that point, and by another small long island (*Isla Gami*), which shelters the road from the South, and where there is a good sandy beach for landing, the depth 7 fathoms, mud. To reach this anchorage from the eastward, and being South of Benado Islands, steer westward for the North point of Parida, taking care not to go into less than 5 fathoms on the port hand.

The islands which run to the eastward for 4 miles from the South end of Parida terminate in Bolaño (or Volaño) and Baraco to the S.E. of it; these are the largest, the others are unimportant. At three-quarters of a mile South of Baraco are some rocks, and there is also another at $1\frac{1}{2}$ mile E.N.E. of it. Midway between Bolaño and San José Island are a cluster called *Lenartes Islands* in Capt. Wood's chart.

Chimmo Bay is at the S.W. end of Parida, and has a line of islands stretching to the N.W. from its southern point, the outermost of which is called *Sta. Cruz*. The watering-place in Chimmo Bay is in its N.E. part. There is a channel around the North end of Parida, but off the North end of the island it is very narrow, though deep.

From *Santa Cruz Point*, the S.W. end of Parida, to the *Boca San Pedro*, which is a more direct opening to the river leading to David, the distance is 11 miles, the interval being occupied by banks over which the sea breaks heavily and the water very shoal. On the East side of the Boca San Pedro is the *Isla Sevilla*, separated from Isla Brava, before mentioned, by the Boca Brava. On Sevilla abundance of game may be procured, deer, goats, &c. Although the natives say that the Boca San Pedro is practicable for boats, yet the French surveyors arrived at an opposite conclusion, and that the Boca Chica was the only one advisable.

The Coast between Chiriqui and Burica Point forms an extensive bay, 34 miles wide. The north-eastern part of the bay is formed by a series of islands formed like those of Chiriqui just described. The island of *San Pedro* is the westernmost of those which belong to the River of David, and the coast continues a regular curve, first to the northward of West, and then to the southward, getting higher to the southward till it terminates in Point Burica. On the northern shore of the bay are the Rivers Piedra, Pinos, and Bartolomé, but there is said to be no port or place of resort, although native report points out two or three spots of local importance; of these, *Guanavano*, at the entrance of a river about 15 miles North of the point, is one; another is *Charco Azul*, also at the mouth of a river some miles to the South of it. These places, and the coast generally, are quite safe as open anchorages.

The **Ladrones** (or **Zedzones** of Colnett) are two islets or rocks, moderately high and barren, lying 14 miles S. by W. from the S.W. point of Parida. They are very steep-to, and 70 fathoms was found close to their southern edge. They are quite safe in all directions, except to the North, where some rocks lie a mile off.

At 4 miles North of the Ladrones (8½ miles according to the chart) is a reported dangerous reef, which does not even show at low water, when there is 6½ ft. water over it. It is said to lie with the West side of Parida bearing N. 9° E., and the East side of the Ladrones bearing South.

Montuosa is a small lofty wooded island, completely isolated, 26 miles S.E. by S., southerly, of the Ladrones, and 22 miles West of Coiba. It is safe, except some rocks to the East of it, and is a good mark for approaching the coast. A reef extends about 3 miles north-westward of it.

Colnett says:—"It rises to a considerable height, and is 5 or 6 miles (?) in circumference, its summit covered with trees; the greater part are those which bear the cocoa-nut, which gives it a very pleasant appearance; but islets and breakers extend off its East and West ends, to the distance of 3 or 4 miles. The bottom is rocky on the South side, as is the shore near the sea. There is a beach of sand behind some little creeks that run in between the rocks, which makes a safe landing for boats. Here we went on shore, and got a quantity of cocoa-nuts, with a few birds. The Spaniards or Indians had lately been there to fish on the reef for pearls, and had left great heaps of oyster-shells. There were a great plenty of parrots, doves, and iguanas; and it is probable that other refreshments might be obtained, of which we are ignorant. At all events, it may be useful to whalers or cruisers, by offering a place where the sick may be landed and cocoa-nuts procured, whose milk will supply the want of water."

POINT BURICA, or Burrica, makes afar off like an island with three summits equally elevated and distant from each other; on nearing the cape another low point is made out which seems at first like an island, but is afterwards seen to form part of the point. To the southward of the point breakers extend for a mile, and terminate in this direction by a large, high and isolated rock, which forms an outer beacon. The cape may be seen in clear weather 35 miles off, and is thus an excellent landfall for ships coming either from eastward or westward.

The *territory of Burica*, according to Mr. J. H. Smith (1854), does not belong to the general government of the United States of Colombia, but is exempt from some of the imposts. It extends from the *Guanavato coast*, on the East side of the Burica peninsula, to the Rio Claro, which falls into the Golfo Dulce. The coast between is an extensive region of cocoa-nut trees, 21 to 25 miles in length. But this thinly populated and uncivilized region has but little claim to exact political or social divisions, and its nomenclature and inland features are alike vaguely known. The exclusive claim of these states

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to the transit route across the isthmus has led to more attention being paid to its boundaries than they otherwise deserve.

The Coast from Point Burica trends generally to the N.W., and is low, and covered with cocoa-nut trees. There are no places of interest, and only four Indian villages on the space of 15 miles between that point and Point Platanal, near the entrance of the Golfo Dulce. At 5 or 6 miles from the South point is a projection called Punta Gorda. The intermediate coast has not been surveyed, but is believed to be safe. A running survey of the coast and harbours beyond Point Platanal, as far as Istapa, was made by Capt. T. de Lapelin, in the French corvette *La Brillante*, in 1852, and from his pamphlet the following directions are chiefly taken. The coast between Burica Point and Mount Judas is from the chart of M. M. de Lapeyrouse, 1857.

2. COSTA RICA.

The state of Costa Rica is one of the smallest in area and population of the Central American Republics. It extends from a point a few miles N.W. of the Golfo, on the eastern shore of the Gulf of Dulce, to a point on the North side of Salinas Bay. In the northern part is a district formerly named *Guanacaste*, now called *Liberia*, which includes several of the proposed termini of the inter-oceanic canals and railways, and this gives it an importance it does not otherwise possess.

The soil of Costa Rica is exceedingly productive. On the "tierras calientes," or torrid lands, which run back from the Pacific up to an elevation of 3,000 ft., almost all the tropical productions abound. Above these are the "tierras templadas," which are terraces making out from the main Cordilleras (following very nearly the longitudinal axis of the state in a N.W. and S.E. direction), and are from 3,000 to 5,000 ft. above the level of the sea, producing sugarcane, potatoes, corn, coffee, oranges, &c., in great perfection.

Still above the tierras templadas are the tierras frias, or cool lands, which are from 5,000 to 6,000 ft. above the ocean level, among which several volcanos shoot up, varying from 8,000 to 11,000 ft. in height. The forests which extend over a large portion of the republic, abound in timber suitable for ship-building; also mahogany, brazil, and various other valuable dyewoods.

The cultivated portion of Costa Rica lies principally within the valley of the Rio Grande, which flows down the western slope of the main mountain range into the Gulf of Nicoya. Fully seven-eighths of all the inhabitants are here concentrated, in a district not exceeding fifty miles in length by an average of twenty in breadth. The total population is estimated to amount to about

200,000. In 1882 the value of the exports from this state amounted to about £750,000, coffee being the chief article.

The **GULF of DULCE** lies 30 miles to the N.W. of Burica Point. But very little was known of it till in 1849 a concession was made to a French company, and in 1850 a plan of it was made by M. Louis Cheron, and again in 1852, when its shores and capabilities were examined by the officers under Capt. de Lapelin. From this it would appear to be one of the best points of the old Spanish territory for European colonization, considering its fertility, healthiness, and safety of its navigation. The gulf is recognisable at a great distance. Its outer points are well marked, and according to the chart are 15 miles apart, East and West, but the distance is reported by several observers to be not more than 10 miles.

Cape Matapalo, on the West, is the South extremity of the peninsula and of the Cerro de Sal si Puedes. It is high, steep, and covered with trees, with some reddish coloured land-slips. About a mile E.S.E. of it is an isolated rock 10 or 12 ft. high, easily seen in all directions.

Platanal Point, the eastern point, is the South end of a promontory formed by the chain of mountains which separates the low lands of Burica from the plain of the Rio Coto. This promontory is terminated to the North by a round-topped peak, covered with trees, rather higher (2,329 ft.) than those near it. This hill will indicate the *Punta del Banco*. All the shores of the entrance are clear and free from danger; but in coming hither it is well to make Cape Matapalo, as the only inhabitants are on the West side, at the Punta Arenitas, and on this side are also convenient anchorages in case of being becalmed during the ebb, as throughout the gulf, except in the Rio Coto Bay, the depths are 20 and 30 fathoms at 2 to 4 cables from the shore, and then deepening to 50 and 100 fathoms.

The outer portion of the gulf runs in a North and South direction 22 miles, with a breadth of 16 miles; beyond this it runs to N.W. for 25 miles to the foot of the Cordillera, where it is 10 miles wide. From Point Matapalo to the Rio Rincon at its N.W. end, an extensive plain extends to the sloping foot of the Cerro de Sal si Puedes. The shore is all low and wooded. At 5 miles N.N.E. of Matapalo Point is *Punta del Sombrero*, and 3 miles further that of *Tigrito*. Off these two points are some rocks above water, those off Sombrero extending half a mile, and off Tigrito three-fourths of a mile. These are the only dangers in approaching Punta Arenitas.

PUNTA ARENITAS,* 9 miles beyond Punta del Tigrito, appears to be low

* Punta Arenitas is called Punta Arenas (Sandy Point) on some charts, but the distinction is here made that it may not be confused with the more important Punta Arenas, the chief port of the republic, in the Gulf of Nicoya.

Some later information concerning Punta Arenitas, and other parts of the coast, is taken from the French "Instructions Nautiques sur les Cotes Ouest du Centre-Amerique, et du Mexique," by M. A. Paillés, 1879.

and entirely covered with wood. The village, formerly standing on the extremity of the point, has been destroyed by an earthquake, and the inhabitants, about 400 in number, removed to a spot a little North of the point, naming their new village *Santo Domingo*. At a cable East of the point is a coral bank, which partially dries at low water; its greatest breadth East and West is 2 cables, and it is twice that length North and South. Its edges are very steep-to, and small vessels can pass between it and the point. You may anchor to the N.W. or to the S.E. of the point. The latter is the best for vessels making but a short stay, and they will here get the sea-breezes and avoid the excessive heat occasioned by the shelter of the point. To take this anchorage the mark was to bring the flagstaff or the last cluster of houses of the village formerly standing on the point to bear W. by N. $\frac{1}{4}$ N., and Punta del Tigrito S. $\frac{1}{4}$ E., at less than a mile from the shore in 10 to 11 fathoms, bottom green mud. To reach the anchorage North of the point, having passed the coral bank, bear to the West, steering for an estero (or creek), distinguishable from some large trees with white trunks, with foliage only on the tops, and drop the anchor in about $16\frac{1}{2}$ fathoms, bottom of green mud, at 3 or 4 cables from the shore. This inner anchorage is very good, and any repairs may be done in great security, but if it is necessary to heave down to the keel it is better to go to El Golfito. To communicate with the village, you can land to the North of the peninsula at the entrance of a creek; this point is so steep-to that you can lay alongside as at a quay.

Fresh provisions, in small quantities, may be got at Santo Domingo. Firewood is also cheap; bullocks are to be got at the hacienda del Tigre. The neighbouring forests are rich in spars and timber, but you must cut it yourself. Water is to be got at the River del Tigre, 5 miles to the northward, between half-flood and half-ebb. The French company before alluded to intended to establish themselves on the banks of the River del Tigre. A large house built by them distinguishes the Point del Tigre.

It is high water at Punta Arenitas, on full and change, at 3^h 15^m. The greatest rise is 10 ft. 3 in.; mean rise $5\frac{1}{2}$ ft. The tides are regular throughout the gulf.

The NORTH-EAST SHORE of the gulf is formed by the base of the cordillera, which extends from the Rio Rincon to the Golfito. Its rugged slopes are covered with an impenetrable forest, and leave but a very narrow beach here and there. At 9 miles N.E. by E. from the River Rincon are the Islotes, a small group composed of rocks and coral banks, on which they fish for pearls and mother-o'-pearl. The cordillera then runs for 21 miles E.S.E., terminating at the Golfito. At $4\frac{1}{2}$ miles from the Islotes is the mouth of the Rio de las Esquinas, which traverses a large and very marshy valley near the sea. At 9 miles E.S.E. from Punta de las Esquinas there are some rocks indicating Cape San José; around these rocks they fish for mother-o'-pearl.

North Pacific.

The *Golfito* entrance is about 3 cables wide, and the passage in mid-channel between the high and well-marked point to the North, and the long narrow sandy tongue to the S.W., has a depth of $5\frac{1}{2}$ to $6\frac{1}{2}$ fathoms. This sandy neck divides the *Golfito* into two parts, in either of which you may anchor, but if in the eastern part it is not advisable to bring the houses on the point to North of W.N.W. The *Golfito* is a landlocked basin, where you may heave down and careen, but unfortunately in all seasons it rains nearly every day, and storms are frequent. The watering-place is in the North part of this small gulf, but the casks must be filled at low water, and floated off at high water.

The *Rio Coto*, the largest stream which enters the Gulf of Dulce, is $7\frac{1}{2}$ miles S.E. of the *Golfito*, but is not navigable. From its mouth a bank extends to the northward, which joins the tongue dividing the *Golfito*. The coast is low, sandy, with a violent surf, and covered with cocoa-nut trees. To the southward of the river, the coast, though low, is clean as far as *Punta del Banco*, the S.E. point of the Gulf of Dulce, *Pavon Bay* lying between them.

The Gulf of Dulce, during the fine season, is under the influence of the land and sea breezes (the *terral* and *virazon*), the latter blowing from S.E. to S.W. between 11 a.m. and sunset, when it is replaced by the *terral* blowing from North to West. Notwithstanding its hot and humid climate, the gulf is considered healthy by the natives, but this can afford but little evidence of its effects upon European colonists.

The Coast beyond Cape Matapalo extends for 18 miles W. by N. $\frac{3}{4}$ N. to the high and abrupt *Punta Sal si Pudes*. It is a narrow and sandy beach, forming a large cocoa-nut grove, behind which rises the Cerro. It is very steep-to, for at less than half a mile off shore, in the shoalest part, there is more than 40 fathoms, a strong surf usually beating on this shore.*

At the point *Sal si Pudes* the Cerro approaches the beach, and at less than a mile off the point is a round bare rock, called *Choncha Pelona*, around which the water is very deep, but you cannot pass inside it.

From *Punta Sal si Pudes* to *Punta Llorona* the distance is 13 miles in a N.W. direction. Nearly midway between these points is the *Corcovado*, a large rock 35 ft. high, at the outer end of a reef composed of rocks above water. The irregularity of the depth and the colour of the water, and the breakers off shore between the two points, seem to indicate danger near the land.

Punta Llorona is high, steep, wooded, and formed of cliffs partially covered with a rich vegetation, and a cascade falls over one of its perpendicular precipices. Several islets lie within a few cables' lengths of the point. San

* The name *Sal si Pudes* (get out if you can), applied to this beach, is said to be derived from the fact that the bongos which come here to load with cocoa-nuts, though able to land easily at times, have great difficulty and detention in embarking through the formidable surf.

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Pedro Point is 3 miles N. by E. $\frac{1}{2}$ E. from Punta Llorona; and at $1\frac{1}{2}$ mile off the coast near it is a rocky islet with a few shrubs on it, joined to the land by a chain of rocks, which also projects a cable's length seaward from it. This group shelters a part of the sandy beach called the *Port de San Pedro*, distinguished by a rock surmounted by a single tree. On this beach also, in a small indentation called the *Puertecito de San Pedro*, are some ranchos of Indians who come hither to find the purple dye. *Cape San José*, 3 miles beyond San Pedro Point, is a spur of the chain of hills which overhangs the coast; it may be known by a *rastrado* or a large green patch, bare of trees.

CANO ISLAND, $9\frac{1}{2}$ miles to the West of San Pedro Point, is a mile in length, moderately high, and level. At its N.E. point are a few breakers, and off its West point some sunken rocks extend for half a mile. With this exception, it may be approached on all sides, though it is not advisable to do so from the eastward, as the current drifts towards these last-named rocks. On the N.W. side is a spring and some banana trees, on a sandy beach, where the landing is easy, and where the bongos come to collect the caoutchouc, which is abundant on this island.

The *Rio Ajuja* debouches in the angle where the high land of Cape San Pedro joins the beach running to the North. It is the best shelter that the bongos find between the Gulf of Dulce and that of Nicoya, and is the only place where watering is easy. To the northward of this the coast is high and wooded; its narrow beach is interrupted by the mouths of the Granado and the Idraque, and beyond these is the Boca Sierpe. To the North of these again is *Punta Violin*, off which is a small wooded islet of the same name. At a mile North of this are the *Sacate Islets*. The coast here forms the narrowest part of the isthmus, which separates the ocean from the head of the Gulf of Dulce.

From hence the coast runs to the North for 20 miles, and is uniformly low and wooded. Inland is an extensive marshy plain, on which it is said is a large lake, and is watered by the Rio Burruca. Through this level coast are four bocas or mouths to the river and the lake, and it is said by the natives that these communicate with each other, so that a bongo entering at Sierpe can come out at any of them, or at Punta Mala de los Indios. At the North end of the plain the coast is quite clear and the depths diminish gradually.

At *Punta Mala* is a perpendicular cliff, and the high coast here turns to the westward and N.W. This coast is formed by a spur from the cordillera, and extends $12\frac{1}{2}$ miles to *Point Dominical*. At *Point Ubita*, midway, a reef and some rocks shelter an anchorage, which is said to be deep enough for any vessel, and that water may be procured easily at the Rio Ubita here. It is constantly frequented by the Indians. About 3 miles S.E. of Ubita is a large reddish coloured rock called *La Ballena*, and at a mile E. by S. from this are three small and pointed rocks called *La Ballenita*.

Point Naranjo is 16 miles to the W.N.W. of Point Dominical; the coast

between is a sandy beach, traversed by some inaccessible rivers, and is quite clear. At $3\frac{1}{2}$ miles W. by N. $\frac{1}{4}$ N. from this point is that of *Las Quepos*, covered with trees. Between these points are a number of islets and rocks, forming two distinct groups, which are connected with the shore. The southernmost group is called the *Naranjos*, the northern the *Quepos*. The largest of the latter group is called *Manuel Antonio*, and shows a remarkable gap. It shelters a small sandy bay, fit for the bongos which come fishing for turtle.

Point Mala, or Judas, is 22 miles W. $\frac{1}{4}$ N. of the *Quepos*, the coast between being a sandy beach, beaten by a continual surf, without landing-place. Near Punta Mala there is a line of cocoa-nut trees a mile in length. The point is very low, and covered with trees and mangroves. To the South of it a reef of rocks and islets extends for $1\frac{1}{2}$ mile. The depth is very irregular on its edges, and the current drifts past it to the westward, frequently at 2 miles, and never less than 1 mile an hour.

Point Guapilon is $6\frac{1}{2}$ miles N.W. by W. from Punta Mala; the coast between is sandy and low, but is lined with breakers to 3 or 4 cables' lengths off abreast the small rivers *Usubre* and *Tusubre*. Off Point Guapilon are two rocks awash, on which the sea breaks; they are half a mile off the point, and have a depth of 9 and 10 fathoms between them and the point. At 4 miles N.W. by W. is *Cano Isle*, which shelters the harbour named Port Herradura.

Port Herradura, at the S.E. entrance to the Gulf of Nicoya, is a horse-shoe bay, as its name indicates, facing the West, and is $1\frac{1}{2}$ mile wide between the West point of Caño Island on its South side, and Herradura Point to the North. The harbour of Herradura is a good anchorage, is uninhabited, and without any communication with the interior; it has no other resources than an excellent and abundant watering-place.

Caño Island is covered with trees, and has a reef all around it, which connects it with the shore. The northern point of the bay is also bold and rocky, and a reef skirts it on all sides for nearly 3 cables, but the edge of this reef is steep-to, as is the case all round the bay, and therefore the shores should be carefully approached. The South point consists of a high rounded hill, with high land behind it.

Havannah Rock, nearly awash, lies nearly in the middle of the bay, with a house on the beach bearing N.E. $\frac{3}{4}$ N. three-quarters of a mile, and the pinnacle of Caño S.W. by S. 9 cables. At the head of the bay is a watering-place, where excellent water may be obtained. Sir Edward Belcher says that twenty casks at a time may be obtained by rolling them into a small lake on the beach. This lake was made to be in lat. $9^{\circ} 38' 30''$ N., long. $84^{\circ} 36' 7''$ W., but later determinations place it in long. $84^{\circ} 39' 30''$. The anchorage is off this watering-place in 5 to 8 fathoms, but vessels may ride close to the shore by veering the whole cable with a warp to the beach, and find good shelter, except from westerly winds.

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The **GULF of NICOYA** was surveyed by Sir Edward Belcher in the *Blossom* in January, 1839. It was also examined by Capt. de Lapelin in *La Brillante*, and we derive much of what follows from that officer's remarks.

CAPE BLANCO is the south-westernmost point of this extensive gulf, and is thus described by Dampier:—"Cape Blanco is so called from two white rocks lying off it. When we are off at sea right against the cape, they appear as part of the cape; but being near the shore, either to the eastward or westward of the cape, they appear like two ships under sail at first view, but coming nearer they are like two high towers, they being small, high, steep on all sides; and they are about half a mile from the cape. This cape is about the height of Beachy Head in England, on the coast of Sussex. It is a full point, with steep rocks to the sea. The top of it is flat and even for about a mile; then it gradually falls away on each side with a gentle descent. It appears very pleasant, being covered with great lofty trees."*

The entrance to the Gulf of Nicoya is distinctly marked by Cape Blanco on the West, and Point Herradura on the East, forming an opening $27\frac{1}{2}$ miles wide. Cape Blanco is the point that has been generally made by keeping a little to the East of its meridian; but there is probably some advantage gained by making the eastern side as the currents shift to westward, and the distance would be rather shorter.

Cape Blanco may be seen at 25 miles distance when bearing N.N.W., appearing then like an island, the top of which is flat, and having near its centre a slight indentation. Several white patches also serve to distinguish the cape from the land at the back of it. The largest and lowest white spot is formed by an islet quite white, lying South of the cape, from which it is separated by a channel a mile wide; but it does not appear to be detached until you are within 10 or 15 miles. It is only when Cape Blanco is seen from the West, or to the North of West, that its true termination can be seen; being much lower than the surrounding land, it projects like an island, and falls abruptly towards the sea. At the same time a small needle-shaped rock will be seen a little to the South of the islet.

As far as the anchorage of Punta Arenas, the Gulf of Nicoya has few dangers that are not visible. All the points and the shores may be approached to within 2 miles. The islands are numerous, and some of them large; they are covered with trees, but are uninhabited, and at present possess no interest whatever. The western part of the gulf is nearly a desert, and the ports, which as yet have not been frequented, lie on the East side; these are those of Herradura (previously described), Caldera, and Punta Arenas. The bay of Tarcoles also affords a good anchorage, where communication is easy with the shore.

* To the westward of Cape Blanco a bank is marked on some charts; Capt. de Lapelin doubts its existence.

CALDERA was the port of entry for Costa Rica till 1840, at which time its unhealthiness caused it to be abandoned for Punta de Arenas, notwithstanding its security, and its proximity to the capital. It is about 33 miles N.E. of Cape Blanco.*

PUNTA ARENAS (or Puntarenas).—In 1840, Punta Arenas was declared a free port, and it is now one of the most important commercial places on the coast of Central America. It is the only port of the state of Costa Rica, which is frequented on the Pacific, and through it almost all its exports and imports pass. The sandy peninsula on which the town stands shelters an interior anchorage, called the *Estero*, into which, at high water, vessels drawing 13 ft. can enter; to the South of it is a spacious roadstead, with an average depth of $5\frac{1}{2}$ fathoms, which, although secure in the fine season, requires some precautions against the southerly winds.

Punta Arenas has a population of about 1,500. Its streets are straight and regular, but disagreeable from the sandy soil. They extend along the *Estero*, by which all communications with the outer road take place. Esparta, 13 miles distant, is connected with Punta Arenas by a railway. At Alajuela, 320 ft. above the sea, the railway again begins, and runs to Cartago, via San José.

In 1882, 94 vessels, with a total tonnage of 156,917, entered this port, nearly all belonging to the United States. The value of the exports for the same year was estimated at £703,862, of which coffee represented £684,825; india-rubber and hides make up the balance.

In entering the Gulf of Nicoya the only precaution necessary is to hug the eastern shore, for the ebb tide, which runs to S.W. to the South of the Negritos, is less felt, and the depth, though great, is less than on the western side; so that in case of a calm, or contrary current, an anchorage is more readily found; or you may be drifted out of the gulf, or else on to the Negritos (or Nigretas), near to which the depths are great. You may readily know them by a large black rock in front of them, having the appearance of a sail.

* Caldera has been proposed as the Pacific terminus of one of the inter-oceanic communications. According to a report, published in 1866, by Mr. F. Kurtze, C.E., director of the public works of Costa Rica, a wagon road from sea to sea was just completed, starting from Port Limon, near Point Blanco, 60 miles South of Greytown, on the Atlantic side, crossing the summit level near Cartago, 5,118 ft. above the sea, passing near San José, the capital, terminating at Caldera. It is a macadamised road, 60 ft. wide, with cut-stone bridges, and with ample width for constructing a railroad over much of its course. Since that time a railway has been constructed from Port Limon to Rio Sucio, a distance of 72 miles, and about 26 miles from San José.

Two canals have also been proposed to terminate in the Gulf of Nicoya, one from the River San Juan, by the Rio San Carlos, terminating near Punta Arenas; and a second from the Lake Nicaragua, by the Rio Nino, and the Rio Tempisque, which falls into the head of the Gulf of Nicoya.

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PUNTA ARENAS.

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Soon after passing the line East and West of the Negritos, you will see between these islands and that of San Lucas, two remarkable islets. The first of these, called *Cagaves* (the *Aves* of Sir Edward Belcher), is like a circus open to the East formed by perpendicular rocks, crowned with trees, and surrounded by a beach of pebbles covered at high water. The second is a conical, lofty, and wooded rock, sufficiently designated by its name *Pan de Azucar* (Sugar-loaf). Having made these islets, you will next discover the lighthouse rising from the trees. It is on a white or yellow tower of several stages, elevated 64 feet above the sea, and showing a *fixed bright light*, said to be visible 9 miles. At the same time you will see, but much more to the left, a large building, which serves as a custom-house. This is (or was) the most westerly building, and nearest to the Puntilla de Punta Arenas. It is painted white, and covered with tiles, and near a cluster of cocoa-nut trees, the only ones on the peninsula.

The custom-house or the lighthouse being well made out before being East and West with the Pan de Azucar, steer so as to bring the first not more North than N.N.W., or the second to the North of N. by W., so as to avoid the banks of Punta Arenas, which limit the road to the North and West.* It will be necessary to keep close to the bearings here laid down, for to the North of the Negritos the flood tide runs very strongly to the W.N.W., and the ebb to E.S.E. These banks are formed by the rivers, and through them runs the channel of the Estero, the depth and direction of which change with every tide. A large iron buoy has been moored off the South extremity of the banks, and is very useful to vessels rounding them.† Having approached the anchorage on the foregoing bearings, you must anchor when the Pan de Azucar bears about S.W. by W., or the Cagaves S.W. This position is about a mile from the beach, in a depth of $5\frac{1}{2}$ to $6\frac{1}{2}$ fathoms, fine sandy mud, and easy of communication with the town at all times of tide. A little farther to the East the bottom is better for holding, being more mud than sand. These anchorages may be taken during the fine season, or from November to June; but during the summer they are too near the banks, as the bottom is continually shifting from the strong currents, and you may be drifted on to the banks. The better position at this time will be with the custom-house bearing N.W. by N., the lighthouse N.N.W., and the Pan de Azucar W.S.W. in $5\frac{1}{2}$ fathoms, muddy sand. It will be as well to moor S.E. and N.W., to avoid the chances of fouling your anchor by the continual swinging of the ship.

The anchorage of the Estero cannot be taken without a pilot. The charges for this are 1 dollar per foot draught.

* If the lighthouse or the town be not made out before having passed the parallel of the Pan de Azucar, and thus bearing to North of N.N.W. or N. by W., it will be necessary to fall back again to the southward before bringing these marks on, for without doing this there will be a risk of getting on to the banks which project to the S.E.

† Anuario Hidrografico de la Marina de Chile, 1881, p. 288.

The tides are regular at Punta Arenas: their maximum velocity is $1\frac{1}{2}$ knot, and the average 1 knot. The establishment of the port at Punta Arenas is $3^h 10^m$, and the range at springs 10 ft. 2 in.

Water is to be procured at the Rio Baranca, 7 miles to the East of the anchorage. The bar can only be passed between half flood and half ebb. The river must be ascended for a mile, until the boat grounds, before which the water is not fresh, and even then is sometimes not very good. On account of the tides, not more than two trips can be made in the day. Fresh provisions are abundant, but live bullocks cannot be easily procured. Sea stock may frequently be procured, but not in large quantities. The healthiness of Punta Arenas is but comparative; fever is prevalent throughout the year, attacking natives and strangers alike, but milder in the fine season than in the opposite one.

There is no coasting trade in Costa Rica, as there is only one port open on the Pacific. The carrying trade along the coast of Central America is almost entirely monopolized by the American Pacific Mail steamers, in connection with the Panama Railway.

Punta Arenas was a free port till January, 1861; since then customs duties have been collected, but the shipping dues have not been altered. These are tonnage dues and anchorage dues, each 25 cents per ton register, 5 dollars (£1) for license, 1 dollar per man for hospital dues, $\frac{1}{2}$ real (3d.) per ton lighthouse dues.

Owing to the partial filling up of the harbour, vessels are obliged to lie much farther off than formerly, and there is some trouble in landing &c., at low water. A wharf was constructed in 1871, and is used for landing and shipping cargo, and there is also a small steam-tug for towing the launches. With steamers, which arrive at all hours of the day and night, much damage is done to the goods in the launches by rain and spray. The lighthouse is not in good order, and much reliance should not be placed on it; the commander of the Chilean corvette *Chacabuco*, 1878, stated that the lights at the town were visible before that of the lighthouse was seen. On account of the deterioration of Punta Arenas, it was proposed to remove the port to *Tarcoles*, a spot to the eastward, and nearer to the capital; but it was negatived by the Congress in 1864. The restrictive policy of the Government has much reduced the prosperity of the port, which is now little more than a dépôt.

The COAST to the north-westward of Cape Blanco is almost unknown, and consequently, should not be closely approached. A very imperfect survey of it was made by Mr. Hull, R.N., in 1859, and Capt. de Lapelin also made a slight sketch of it, but the two do not agree. The coast is high and wooded, and has a beach of white sand interrupted at intervals by reddish-coloured cliffs; the higher hills rarely exceed Cape Blanco in elevation. The beach is

* Cape Guano. A. A. Lapelin is marked on his chart at 18 miles from Cape Blanco, and

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THE BIGHT OF PAPAGAYO.

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of sand, separated by rocks into an infinity of bays, which will offer easy landing-places. From Cape Blanco the coast first trends about 20 miles to the N.W., and then 20 miles to the W. by N. to *Cape Guiones* or *Morro Hermoso*, off which extends a reef. The coast then turns to the N.W. by N., and at about 28 miles distant is *Cape Velas*, in about lat. $10^{\circ} 19' N.$, long. $85^{\circ} 54' W.$, so called from a rock off it sometimes being mistaken for a sail. The cape is well wooded, and some islets and rocks lie off it.*

The BIGHT of PAPAGAYO may be said to commence here, extending to the northward to Realejo, being but a slight curve in the general line of coast. It is scarcely worthy of the name, but becomes more familiar from the fact of the peculiar winds experienced off it called by the name, which are elsewhere described. Suffice it here to state, that the *papagayo* is a strong wind, blowing from N.E. to E. by N., with a bright, clear sky overhead, and a glaring sun, with a dense atmosphere.

At Cape Velas, Capt. Sir Edward Belcher lost the *papagayo*; "therefore," he says, "the limits may be included in a line drawn from Cape Desolado to Point *Realejo*, and it is rather a curious phenomenon that the strength of this breeze seldom ranges so far as this chord, but seems to prefer a curve at a distance of 15 or 20 miles from the land."

In passing the Bight of Papagayo, it is considered best to keep at 5 or 6 miles off shore rather than farther off; the squalls and calms are of shorter duration, and less force at this distance than in the offing. Should this course be impracticable, a distance of 30 to 45 miles should be taken. In proceeding to the North the wind will be found to veer more to the East.

Gorda Point,† according to the chart, lies 14 miles to N.N.E. of Cape

miles farther is *Morro Hermoso*, but Mr. Hull did not observe anything prominent in these positions. Capt. de Lapelin says that he found neither point nor hillock noticeable in the position assigned to Cape Velas and the Morro Hermoso, and in his passage from the North it was not until he reached lat. $9^{\circ} 53' N.$, long. $86^{\circ} 52' W.$, that he was 21 miles further South, and 12 miles West of the position then assigned to Cape Velas, that they saw a greyish cliff, slightly projecting from the line of coast, perpendicular, and surmounted by some trees. The sea broke on a reef at its foot, which extended $1\frac{1}{2}$ mile. It also broke on the numerous detached rocks to the South of a white sand islet, on which two rocks stood, resembling like sails. This cliff, called *Cabo Guiones* (for the local pilots knew no point under the name of *Las Velas*), is 30 miles W.N.W. of Cape Blanco, and 20 miles West of the coast laid down on the charts.

* We lay along a deep bay, and passed some very remarkable rocks or rocky islands, some with green tops, the Port of Matapala bearing S.S.E. Between that and these rocky islands a number of small, high, white rocks shot up, resembling vessels under sail, bearing East, E. by N., and E.N.E., a little bay extending landward, and called, as I suppose, from these little rocks, "Puerto Velas."—G. V. Skinner, Esq.

† Point Catalina (of Bauza): from the disjointed portions or islands, it might have been called that of *Murcielago* to be mistaken for it.—Voyage of the *Sulphur*, vol. 1, p. 185.

North Pacific.

Velas, in lat. $10^{\circ} 32' N.$, long. $85^{\circ} 47' W.$, and some islands are said to lie off the intervening coast. At this point the coast turns abruptly to the E.N.E., towards Port Culebra.

Off Point Gorda are several high rocks, the two largest, which are close together, are about $2\frac{1}{2}$ or 3 miles from the land, the others lie principally more to the North and N.E.; they were all high, and the smaller ones have very much the appearance of upright tombstones; others again, at first sight, appear like a ship under canvas.

PORT CULEBRA was surveyed by Capt. Sir Edward Belcher in 1838. The spot at which he observed, at the head of the port, he places in lat. $10^{\circ} 36' 55'' N.$, long. $85^{\circ} 38' W.$ (corrected). The entrance to the port is between the *North* and *South Viradores*, some detached cliffy islands, $1\frac{1}{2}$ mile apart. Between the South Viradores and *Cacique Point*, to the N.W. of which they lie, there is a channel of 5 to 10 fathoms; but, as a rocky reef runs off a quarter of a mile to the West of the point, and some detached rocks lie South of the Viradores, it should not be used.

Cocos Bay lies to the southward of the South Viradores, and between *Cacique Point* and *Miga Point*, bearing S.W. by S. from the former, the distance being about $1\frac{1}{2}$ mile. These points are both rocky cliffs, surmounted by hills. Cocos Bay may be about a mile in depth within the line of opening. The bottom is formed by a sandy beach, off the South part of which a line of rocks runs North about a quarter of a mile, and another small rock lies in its eastern part. It lies entirely open to the N.W. *Sesga Point* lies $1\frac{1}{2}$ mile S.W. from Miga Point, the West extreme of the bay, and midway between is a cliffy islet. To the eastward of *Cacique Point* is a similar bay to Cocos Bay, having about the same width to *Buena Point*, which forms the South point of Port Culebra. The port extends nearly 4 miles within the two entrance points, Buena and Mala, a mile asunder; and is about 2 miles wide, the depth even, 6 to 18 fathoms, and anchorage everywhere.

Port Culebra is certainly magnificent; and, from information by the natives, it is connected with Salinas, and thence to Nicaragua, Granada, &c. If any railroad is contemplated in this quarter, it ought to enter at the Bay of Salinas, which would render these two ports important.

Water fit for consumption was not found at the beach, but may be obtained a short distance up the creek, which a boat may enter at high water. If wells were dug, doubtless it would be found at the N.W. side, as the surrounding country is mountainous. Another symptom in favour of this is the thickly-wooded sides and summits, as well as bright green spots of vegetation throughout the bay.

Brazil wood is very abundant; mahogany and cedar were observed near the beach, but as they have been employed cutting the Brazil, probably all the cedar and mahogany, easily attainable, has been taken. Timber, in great variety, abounded. In the bay, where H.M.S. *Starling* was at anchor, there

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was a large village, where the natives were anxious to dispose of their productions, consisting of fruit, stock, cattle, &c.

The **Murcielagos** lie to the southward of Cape St. Elena; their number is considerable. Two rocks lie to the West of the group more than a mile off, according to Capt. de Lapelin, but they are not shown on the English nor the later French charts.

Sir Edward Belcher says the Murcielagos or Bat Islands are eight in number, and almost form two distinct harbours, the smaller islands making a crescent by the South, one large island protecting the East, and another of similar size forming the line of separation. He anchored in the inner or eastern harbour, and completed his water at a very convenient position, in 32 fathoms, with a hawser close to the shore.

The springs are numerous, and there are tolerable rivulets; but only that they watered at (between the centre point and the main) is safe to approach, by reason of the constant surf. The gulf squalls, even in this sheltered position, come down the gullies with great force, and impeded the work as well as endangered the boats. The geological character of the cape and islands is a schistose serpentine, containing balls of noble serpentine.

CAPE ELENA (or Santa Elena) is about 22 miles N. by W. $\frac{1}{2}$ W. of Gorda Point, the coast between being quite unknown. The cape is the western extremity of the peninsula which separates the Murcielagos from Elena Bay. Lieut. Boucarut, who examined this coast in the French corvette *La Constantine*, in 1859, applies this name to the western point, and calls another projection 3 miles to the N.E. *Point Elena*. They are each bold, but at 1 or 2 cables' lengths from the first point is a *sunken rock*, and at a mile West of the second point is another, which require all caution in approaching Elena Bay.

The peninsula, of which these points are the West and N.W. extremes, is like a long prism, the sharpest angle uppermost. The ridge is much serrated, and on its North side is even and very steep. It is quite barren.

ST. ELENA BAY (or *Elena Bay*) is to the eastward of the inner point, and is about 5 miles wide in the opening. Its northern point is *Point Descartes*, at a mile due West of which a sunken rock is marked on the French chart; and a second rock, at a quarter of a mile in the same direction. In the S.E. angle of the bay is a smaller inlet, *Tomas Bay*, open to the N.W., three-quarters of a mile wide at the entrance, in which the depth is from 8 to 12 fathoms, and probably affords anchorage and shelter from the S.W., particularly in a channel to the West of a peninsula which separates its head into two inner bays. There are several islets in Elena Bay, of which the *Vayaces*, lying off the entrance of Tomas Bay, are the southernmost. At about 2 miles N.N.E. of these is a higher island, *Juanilla*; and at $1\frac{1}{2}$ mile S.S.E. from Point Descartes is another, *Despensa*.

SALINAS BAY was more exactly surveyed by Lieut. Boucarut, in the French vessel *Constantine*, in 1859. Between *Point Sacate*, which is 2 miles

N.E. by N. of Point Descartes and *Point Arauca Barba* on the North side, the entrance is $2\frac{1}{2}$ miles wide, and the depths 18 to 20 fathoms. From this line to a narrow sandy beach at its head the depth of the bay is 4 miles, and the depth gradually shoals to 7 and 4 fathoms. *Salinas Island* is placed by Sir Edward Belcher in lat. $11^{\circ} 2' 50''$ N., long. $85^{\circ} 43' 40''$ W. (corrected). It lies on the South side of the bay, and is almost connected with the South shore by a shoal which has from 3 to 16 ft. water on it, but 9 fathoms between the shoal and the S.W. coast. On the North side of the bay a reef of rocks lies against the shore, called *El Osteonal*. To enter Salinas Bay, a good mark, according to Capt. de Lapelin, is to bring the sharp volcanic Peak of Oroquieta, cleft on the summit, and 5,200 ft. high, to bear S. 83° E., which will lead up to the island, under the shelter of which there is good anchorage in the season of the West and S.W. winds.

Salinas Bay offers many facilities for commercial purposes, and being separated by only a narrow isthmus, 20 miles wide, from Lake Nicaragua, it has attracted attention as an advantageous terminus for an inter-oceanic canal. The line is from the Nicaragua Lake, by the Sapoa Valley, to the southern part of the bay.

Cape Nathan is $4\frac{1}{2}$ miles N.W. by W. $\frac{1}{2}$ W. from the North point of Salinas Bay, the coast between being much broken up into small bays, with bluff projecting points between them. Some islets lie to the West and N.W. of the cape at a quarter of a mile distant, but the water is deep close outside them. The same irregular and bold coast continues for 8 miles farther to N.W. to the southern entrance point of San Juan del Sur.

3. NICARAGUA.

The Republic of Nicaragua is commercially one of the most unimportant states in the world. Its population, estimated at from 300,000 to 400,000 inhabitants, of whom about one-twentieth are whites, produce or require comparatively little for the rest of the world. Coffee and india-rubber are the chief productions; the value of the exports in 1882 amounted to £419,702, and the imports £352,043. Were it not for its magnificent line of lakes, by which an accessory Transit Route was once established under the auspices of Mr. Vanderbilt, it would not be worth notice. Since the state has thrown off the yoke of Spain, it has gradually sunk in power and wealth, and the few respectable inhabitants have small weight in state affairs. The northern part of the republic is mountainous, but the southern part is a vast plain, in which lie the famous lakes, being about 200 miles long and 100 miles broad, consisting for the most part of fine savannahs. The great *Sierra Madre* range

* The position were well determined by the officers. The longitude was determined westward; but as the meridian of Callao was not known in the *Sulphur*, the determinations are not accurate. † Mr. Bailey, a lieutenant of the *Riot*, was killed in the revolution broke out in 1856, and his remuneration for

bristling with high volcanie peaks, passes through the western part, broken by the above valley, and the lakes leave but a narrow neck of land between them and the Pacific coast. This physical condition of this part of the American isthmus has attracted much attention for the great question of the communication between the two oceans. Leon, a fine old Spanish city, about a day's journey by road from Corinto or Realejo, the Pacific seaport, and now connected with Corinto by railway, is usually (but not always) the capital of the republic; at present the city of Managua is the capital, with a population of about 10,000 or 12,000. A good account of the State is given in Captain Bedford Pim's work, "The Gate of the Pacific," 1863.*

PORT SAN JUAN DEL SUR.—This portion of the coast is interesting, on account of its proximity to the navigable Lake of Nicaragua; but it is for this reason only, as with the exception of the Port of San Juan, called del Sur, to distinguish it from the other San Juan in this State, at the mouth of the River San Juan de Nicaragua, in the Caribbean Sea, it scarcely possesses any harbour or foreign trade, except in dye-wood. It is connected with the telegraph cable laid between Panama and Mexico.

This port and Port Nacascoco, to the northward, were surveyed by Lieut. J. Procter, H.M.S. *Cameleon*, in 1874. The inner South point of Port San Juan is in about lat. $11^{\circ} 15' 30''$ N., long. $85^{\circ} 53'$ W.

The proposed communication with the Atlantic, by Mr. Baily,† was to terminate here—a canal, $15\frac{1}{2}$ miles in length, cut across the narrow tract, separating this port from the Lake of Nicaragua, which, with the Rio San Juan, would form the navigable connection. The summit level rises to 615 ft. above the Pacific, and the lake is about 130 ft. above the same.

Mr. Stephens says:—"Our encampment was about the centre of the harbour, which was the finest I saw in the Pacific. It is not large, but beautifully protected, being almost in the form of the letter U. The arms are high and parallel, running nearly North and South, and terminating in high perpendicular bluffs. As I afterwards learned from Mr. Baily, the water is deep, and under either bluff, according to the wind, vessels of the largest class can ride

* The positions of the various points between the Gulf of Nicoya and that of Fonseca, were well determined by Sir Edward Belcher, whose results have been confirmed by other officers. The longitudes of Captain de Lapelin differ from them by from 6' to 8' farther to westward; but as the chronometers of *La Brillante* were not verified for six months from the meridian of Callao (not from Panama), they cannot be preferred to the longitudes obtained in the *Sulphur*. In the table of positions, at the commencement of this volume, the best determinations are preferred.

† Mr. Baily, a British officer, was employed by the government of Central America to make a survey of this canal route, and had completed all except the survey of an important part of the Rio San Juan (the outlet of the lake into the Caribbean Sea) when the revolution broke out. This not only put a stop to the survey, but annihilated the prospect of remuneration for Mr. Baily's arduous services.

with perfect safety. Supposing this to be correct, there is but one objection to this harbour, which I derive from Capt. D'Yriaste, with whom I made the voyage from Zonzonate to Caldera. He told me that during the summer months, from November to May, the strong North winds which sweep over the Lake of Nicaragua, pass with such violence through the Gulf of Papagayo, that during the prevalence of these winds it is almost impossible for a vessel to enter the Port of San Juan.

"The harbour was perfectly desolate, for years not a vessel had entered it; primeval trees grew around it, for miles there was not a habitation; I have walked the shore alone. Since Mr. Bailly left not a person had visited it; and probably the only thing that keeps it alive, even in memory, is the theorising of scientific men, or the occasional visit of some Nicaragua fisherman, who, too lazy to work, seeks his food in the sea. It seemed preposterous to consider it the focus of a great commercial enterprise; to imagine that a city was to rise up out of the forest, the desolate harbour to be filled with ships, and become a great portal for the thoroughfare of nations. But the scene was magnificent.

"At 7 o'clock we started, recrossed the stream, at which we had procured water, and returned to the first station of Mr. Bailly. It was on the River San Juan, $1\frac{1}{2}$ mile from the sea. The river here had sufficient depth of water for large vessels, and from this point Mr. Bailly commenced his survey to the Lake of Nicaragua."—*Incidents of Travel, &c.*

When the Central American transit route was established to assist the traffic to California, this lonely harbour assumed a different aspect. It was made the Pacific steam packet port communicating with the line established from New York by the way of the Lake of Nicaragua and the isthmus. The government of the state decreed the erection of a city (*Concordia* or *Pineda*) on the shore of the bay which forms the harbour. In 1852 this city consisted of a large encampment and a few wooden houses, pompously styled hotels, but on the abandonment of the transit route it sank to nearly its original solitude.

The shore in this neighbourhood is cut up into an infinity of bays or creeks. It is very steep-to, as you nearly touch the shore when in 14 or 16 fathoms. From the great similarity of these bays there is some difficulty in making out the Port of San Juan del Sur, which is most readily done by the bearings of the volcanos of Momobacho, Omotepe, Madera, or Orosi, which rise above the land like so many beacons.

Momobacho is like that of San Salvador in all particulars. Its height, 4,482 ft., will not allow it to be seen in every direction, except you are some miles off shore. But the pointed summit of the cone of Omotepe (in the Lake Nicaragua), 5,050 ft., high, and the well-marked saddle of the volcano of Madera, can always be seen, in clear weather, overtopping the hills nearer the sea. In favourable circumstances the volcano of Orosi, 5,200 ft. high, with its

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two pointed summits, exactly resembling two turrets united by an immense ridge, can be seen.

The prevailing winds, strong from the N.E., shift suddenly to East or N.N.W. They rarely allow a ship to reach the port without beating up to it. To gain all possible advantage, keep to the land, where the sea is quiet.

The bearings of the volcanos will point out, at a distance, the position of San Juan del Sur, and when near it Omotepe will bear N.E. $\frac{1}{2}$ N., or Madera N.E. $\frac{1}{4}$ E., or Momobacho N. $\frac{1}{4}$ E. These bearings pass over the summit of a hill of a curved figure, and indented like the teeth of a wheel. When within about 12 miles of the land, the points of the bay may be distinguished.

The hill on the North side of the harbour appears like a large greyish patch on the lands behind it. That on the South is like a round clump of reddish colour, and on the continuation of the coast are three white marks, some distance apart; these are three islets frequented by ocean birds. Soon after the entrance is made out the ships at the anchorage will be seen, if there are any, and then some houses on the beach.

Vessels generally anchor outside the harbour in from 9 to 11 fathoms, keeping over to the South point, as a rocky patch narrows the entrance on the North side. The bottom is of sand and broken shells, and is not very good holding ground against the gusts from the N.E., and its great declivity increases the risk of driving, but at the same time this renders it more safe during the gales from West and S.W.

The harbour is shut in by a small bay open to seaward, and as the bottom is the same as outside, but of indifferent quality, it is scarcely worth while entering, as communication is easy behind the heads of the harbour. Water is procured from wells, but it is bad, scarce, and difficult to get. Except a few fresh provisions at high prices, there is nothing to be procured here.—*De Lapelin.*

In 1869, a large iron buoy was moored off the town in 5 fathoms, in the S.E. part of the bay, and near it there is anchorage in 5 to 6 fathoms.

Port Nacascoto, *Naguiscolo*, or *Playa Hermosa*, lies almost adjoining to, and to the N.W. of, Port San Juan, which it somewhat resembles, and, like it, is only the resort of a few natives occasionally. There is no village or town near it, and it never has been resorted to for general European commerce. In its S.E. portion is a sort of canal, excavated for a short distance to facilitate and shorten the transit of the local trade to the town and lake of Nicaragua, to which there is a road or pathway through the forest.

Northward of San Juan del Sur the coast trends nearly straight in a N.W. by W. direction. As was stated in a former page, the district on the coast produces dye-wood, or brazil-wood, for which its ports are much frequented. From information received by Capt. Eden, H.M.S. *Conway*, in 1835, the coast between Brito and San Andres was then much resorted to by vessels to load that article. The landing at some of the places is rather difficult; but

the anchorage is perfectly safe, particularly from November till May. The winds are then constantly from the N.E., though they sometimes blow very strong; but the sea-breezes during those months never reach the coast.

Brito is the first point of interest North of San Juan. It is $7\frac{1}{2}$ miles north-westward of Nacascoco, and is a small bay open to the S.W. It is the terminus of a canal proposed by Colonel Orville W. Childs and Mr. Fay, civil engineers, in 1850-1. The narrow neck of land was well surveyed, and the canal was to leave the Lake of Nicaragua by the River Lajas, opposite the island and volcano of Omotepe, and would require twelve locks to cross the separation into the Pacific. But the costly works required in the Atlantic at San Juan de Nicaragua and at Brito, besides all the intermediate engineering difficulties, place the scheme beyond controversy. Brito was pronounced by competent authority to be in size and shape unworthy of this great ship navigation. This scheme has again been revived in the United States.

The coast to the northward of Brito was surveyed by Malaspina, but we have no particulars of it beyond those given on Bauza's chart. But as there really is no point of maritime interest on it, this is of the less importance. Mr. G. U. Skinner says that after Brito follows *Mogote*, an open anchorage; next *Casares*, off the mouth of a river between some reefs. This, by the road, is 21 miles from the town of Ximotepe, and which is 36 miles from Managua on the lake. At 9 miles further along the coast is the road of *Masapa*, and 16 miles further is the anchorage of *Masachapa*, to the southward of *Point San Andres*. Here the Brazil-wood district terminates.

Sir Edward Belcher, in passing along to the North, began to experience gusts from the Lake of Managua (no high land intervening in its course), causing him to go under treble-reefed topsails, &c.

The coast trends, generally, to N.W. by W., and the position of these places is not marked on the charts. They are generally sandy beaches, separated by cliffs, against which the sea breaks with great violence. When in about lat. $11^{\circ} 55'$ the volcano of *Momobacho*, 4,482 ft. high, will be seen inland when at some distance off shore, as it is not high enough to be seen over the land when close in. It much resembles the volcano of San Salvador in appearance, and seems to be of the same outline in all directions. The land within is very even on the summit, though not very lofty.

Cape Desolada, an appropriate name, lies in about lat. $11^{\circ} 58'$, and it seems almost in mockery that one or two stunted shrubs are allowed to stand on its summit. Mahogany and cedar grow in the vicinity of the cape, and about 10 miles to the N.W. by N. of it is Tamarinda.*

Tamarinda is only an open beach, where the coast becomes somewhat lower, near the river entrance; beyond it, it rises again, and is called the

* The French directions place Punta Desolada in lat. $12^{\circ} 21' N.$, long. $86^{\circ} 58' 51' W.$, or about 30 miles to the north-westward of the above position.

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LAKE OF NICARAGUA.

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Costa Tosca, forming a long sterile ridge. Off the coast the depths appear to be regular, 16 to 17 fathoms, falling rapidly to 25 fathoms a short distance off. At 6 or 7 miles up the river are a few huts, and here vessels drawing nearly 20 ft. can come at high water springs, and ship cedar wood, but the navigation is difficult. No provisions can be obtained except fresh meat, and water is scarce. Vessels can only anchor off Tamarinda in fine weather. At 10 miles northward of Tamarinda is the small loading place of *San Martin*.

Industrie Rock, of about $2\frac{1}{2}$ fathoms, lies 3 miles off shore, about 5 miles southward of the entrance of the River Tamarinda, and $6\frac{1}{2}$ miles north-westward of Cape Desolada. It was discovered by the barque *Industrie* striking on it in January, 1877.

Behind the coast just described are the great lakes so often mentioned, and of such great interest in the project of connecting the two oceans. An American company proposes to dredge the River San Juan, and then cut through the isthmus of Rivas, on the opposite side of the lake, where the highest point is only 26 ft. above the sea.

The LAKE of NICARAGUA (or *Granada*) is a fine sheet of water, and, according to Mr. Baily's account of it, is 90 miles long, its greatest breadth is 40 miles, and the mean 20 miles. The depth of water is variable, being 2 fathoms in some places close to the shore, and in others half a mile from it, increasing gradually to 8, 10, 12, and 15 fathoms, the bottom usually mud, with a depth of 45 fathoms in the centre. The level of the lake is 128 ft. 3 in. above that of the Pacific Ocean at low water, spring tides.

This basin is the receptacle of the waters from a tract of country 18 to 21 miles in breadth on each side of it, thrown in by numerous streams and rivers, none of them navigable except the River Frio, having its course far away in the mountains of Costa Rica, which discharges into the lake a large quantity of water near the spot where the River San Juan flows out of it. The embouchure is 200 yards wide, and nearly 2 fathoms deep. There are several islands and groups of islets in different parts of the lake, but none of them embarrass the navigation, nor is this anywhere incommoded by shoals or banks, other than the shallow water inshore; and even this is but very trifling, or rather it is no impediment at all to the craft at present in use, the practice being to keep the shore close aboard, for the purpose of choosing convenient stopping places at the close of day, as they scarcely ever continue their voyage during the night.

The largest islands on the lake are Omotepe, Madera, and Zapatera. Taken together, the first two of these islands are about 15 miles long, and have gigantic volcanos on them. Zapatera is almost triangular, and 5 miles long. Sonate, Solentiname, and Zapote, are smaller, and uninhabited, but some of them, and the last in particular, are capable of cultivation.

The principal noticeable points on the shores of the Lake of Nicaragua are

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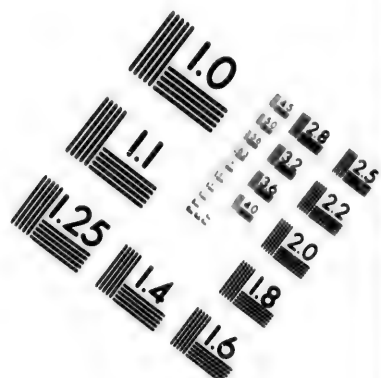
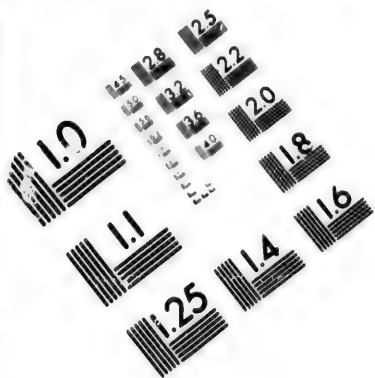
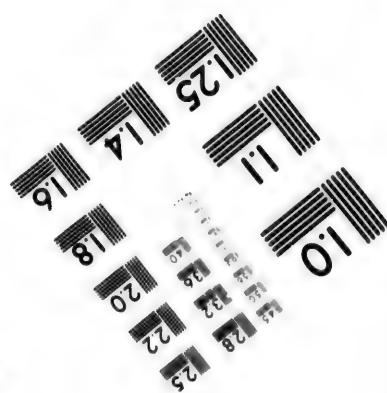
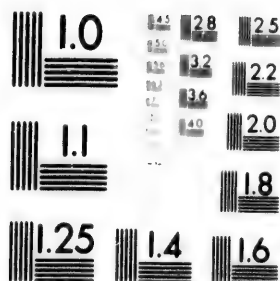


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the city of Nicaragua and the Omotepe Volcano, 5,050 ft. above the sea. Mr. Stephens says it reminded him of Mount Etna, rising, like the pride of Sicily, from the water's edge, a smooth unbroken cone to the above height. Near the town of *Granada*, at the N.W. end of the lake, there is the best anchorage for ships of the largest dimensions.

The Lake of Nicaragua is connected with that of Leon by means of the River Panaloys (or Tipitapa), navigable for the bongos employed in that country for 12 miles, as far as the place called Pasquiel, where the inhabitants go to cut and bring away Brazilian timber. The 4 miles which remain between that place and the Lake of Leon are not navigable by any kind of boat, whatever may be its construction, because, beyond Pasquiel, the channel is obstructed by a vein of rocks, which, when the river is swollen, are covered with water; but in the dry season, the water sinks so low that it can only escape through gradually diminishing fissures in the rocks. At a distance of a mile beyond this first vein of rocks, we find another more solid, which, crossing the river at right angles, forms a cascade of 13 ft. descent.

The River Tipitapa, which discharges itself into the Lake of Nicaragua, is the only outlet for Lake Leon. The lands bordering this river are somewhat low, but fertile, having excellent pasturage; as at Chontales, they are divided into grazing and breeding farms. All this country, covered with Brazilian timber, is scantily inhabited. The only village is that of Tipitapa, situated near the above-mentioned waterfall.

THE LAKE OF LEON OR MANAGUA is from 32 to 35 miles long, and 16 miles at its greatest width. It receives from the circumjacent lands, chiefly from the eastern coast, a number of small streams. According to Mr. Lawrence, of H.M.S. *Thunderer*, it is not so deep as that of Nicaragua.

The Lake of Managua is 28 ft. 3 in. above that of Nicaragua; and, according to M. Garella, the difference between *high* water in the Pacific and *low* water in the Atlantic is 19½ ft. In the proposition for making use of these lakes, it is stated that the ground is perfectly level between the head and Realejo, one of the best ports on the coast; but the distance is 33 miles in a straight line, and to Mr. Stephens the difficulties seemed to be insuperable. Sir Edward Belcher was of opinion that there is no insurmountable obstacle to connecting the Lake of Managua with the navigable stream, the Estero Real, falling into the Gulf of Fonseca.

LEON is the largest city of the state of Nicaragua; it was formerly a place of importance, with a population of 32,000 souls, but has been since greatly reduced by anarchy and other distressing circumstances. The population now amounts to about 25,000. It is situated on a plain about 21 miles from Realejo, 9 miles from the sea, and 16 miles from the Lake of Managua. It carries on some trade through Corinto, with which it is connected by a railway, which is also being extended to Leon Viejo, on the shores of Lake

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PORT REALEJO, OR CORINTO.

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Managua. The houses are described by Mr. Roberts as very similar to those of Guatemala, none being above two stories high.*

The *Plain of Leon* is bounded on the Pacific side by a low ridge, and on the other by high mountains, part of the chain of the Cordilleras.

PORT REALEJO, or Corinto, is the next place in proceeding northward, and is one of the most important ports on the coast, and has in consequence been more frequently visited and described. It was, moreover, minutely surveyed by Sir Edward Belcher, in the *Sulphur*, in 1838, and was visited by Capt. de Lapelin, in *La Brillante*, in 1852. It affords complete shelter to vessels during bad weather, and landing is easy.

Behind Realejo, in the midst of the plain of Leon, is the volcanic chain of *Marabios*, which commences at Momotombo, near Lake Managua, and terminates in the North at Coseguina. These two volcanic cones serve as the extreme landmarks for a line of volcanic peaks which are so numerous as to be embarrassing. No less than eight are visible at the same moment from the offing of Realejo. But about El Viejo and Momotombo there can be no doubt. The latter is known by the whitish smoke enveloping its summit, and is a steep cone of regular figure, so regular as to resemble one of the pyramids. Besides this there is the peak of *Momotombita*, similar in form to Momotombo, but much lower. This is in Lake Managua, and cannot be seen from Cardon, but is visible over the coast to the southward. In going from South to North are the volcanos of *Arusco*, *Las Pilas*, *Telica*, and *Santa Clara*. Telica is the most remarkable of these after El Viejo or Momotombo. It is in lat. 12° 34' 46" N. It is a regular and very steep cone of 2,950 feet.

The port is formed by the three islands of *Castanon*, separating the Estero Doña Paula† from the Pacific on the South, and *Cardon Island* in front of it, forming two entrances, and by the larger island of *Aseradores* (Sawyers) to the northward. The native pilots call the latter Corinto Island. The southern entrance is navigable for boats only, but the northern entrance is safe, with proper precautions, in all weathers.

Cardon Island is three-quarters of a mile in length, N.W. and S.E., and

* The city of Leon is lauded by Father Gage as the pleasantest place in all America, and he calls it the "Paradise of the Indies." Dampier was here in 1685, and his men marched up to it to take it, and they set it on fire, but did not procure much plunder. The way to it, he says, is plain and even, through a champion (champagne) country, of long grassy savannahs, and spots of high woods. About 5 miles from the landing-place there is a sugar work, 3 miles further there is another, and 2 miles beyond that there is a fine river to ford, which is not very deep, besides which there is no water all the way till you come to an Indian town, which is 2 miles before you come to the city, and from thence it is a pleasant straight sandy way to Leon.—*Dampier*, vol. i., p. 218.

† Sir E. Belcher states, in his appendix, that the Estero (or creek) of Dona Paula takes a course toward the city of Leon, and is navigable to within 9 miles of that city. As to any canal into the Pacific, unless behind the Momotombo, Telica, and Viejo Range into the Estero Real, Sir Edward Belcher saw little feasibility in the scheme.

shoal water extends some distance off its seaward face. Its southern point is *Cape Austro*, surrounded by a shoal. To the S.S.E. of this is *Castanon Bluff*, the western point of Castañon Island. These two points are a quarter of a mile apart, and the channel between is called the *Barra Falsa*. *Conway Reef*, 3 miles south-eastward of Castañon Bluff, is dangerous, and should be given a wide berth.

Sir Edward Belcher thus concisely describes the harbour:—"Cardon, at the mouth of the Port of Realejo, is situated in lat. $12^{\circ} 27' 55''$ N., and long. $87^{\circ} 12' 15''$ W. (corrected). The depth varies from 2 to 7 fathoms, and safe anchorage extends for several miles; the rise and fall of tide is 11 ft. Docks or slips, therefore, may be easily constructed, and timber is easily to be procured of any dimensions; wood, water, and immediate necessities and luxuries, are plentiful and cheap. The village of Realejo (the name signifies a barrel or chamber organ) is about 5 miles from the sea, and its population is about 1,000 or 1,200 souls. The principal occupation of the working men is on the water, loading and unloading vessels. It has a custom-house and officers under a collector, comptroller, and captain of the port." Its population now amounts to about 3,000.

Corinto, about a quarter of a mile northward of Point Icaos, the South point of Asceradores Island, has taken the place of Realejo, there being a custom-house here, and several other buildings. On the opposite side of the estero is a road leading to the city of Leon, the trade with which, by this new route, has much diminished the importance of Chinendega. Since the opening of the railway to Leon, the trade of Corinto has been increasing. Between November, 1881, and November, 1882, 27 vessels called at this port for cargoes of fustic, cedar, &c., principally for Havre and Falmouth. The mail steamers call here twice a month, each way. Provisions are scarce and bad; ships' stores may be obtained from Leon, at a high price.

Chinendega is rather a pretty town, with from 8,000 to 10,000 inhabitants, finely situated in a rich undulating plain. It is one of the few towns in Central America which had increased since the independence, and is only 3 leagues from the Port of Realejo, all the trade of which passes through it.—*R. G. Dunlop*, 1844.

The present village of Realejo (for the name of town cannot be applied to such a collection of hovels) contains one main street about 200 yards in length, with three or four openings leading to the isolated cottages in the back lanes of huts.

The inhabitants generally present a most unhealthy appearance, and there is scarcely a cottage without some diseased or sickly-hued person to be seen.*

* "This is a very sickly place, and I believe hath need enough of an hospital; for it is seated so nigh the creeks and swamps that it is never free from a noisome smell. The land about it is a strong yellow clay, yet where the town stands seems to be sand."—*Dampier*, vol. i., p. 221.

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About a mile below the town the ruins of an old but well-built fort are yet to be traced. Vessels of 100 tons have grounded at the pier of Realejo custom-house, but above that they would be left dry at low water.

At Realejo water of the finest quality can be procured from a powerful stream, into which the boat can be brought, and the casks filled, by baling, alongside of a small wall raised to cause a higher level. Here the women resort to wash, but, by a due notice to the *alcalde*, this is prevented. A guide is necessary on the first visit, after entering the creek which leads to it, and which should only be entered at half-flood. It is necessary to pole the remainder, the channel not having sufficient width for oars.

The water from the well on the Island of Aseradores is good;* but Sir E. Belcher says, "I have a great objection to water infiltrated through marine sand and decayed vegetable matter, and consider the chances of sickness one step removed by obtaining it from a running stream."

Capt. de Lapelin says that it was the only place hereabout where coal could be procured, but it was also very dear. Wood may be cut on Aseradores Island, but care is required against snakes. There are also numerous sharks in the Estero. The anchorage here is very unhealthy and hot in the rainy season.

The Island of Cardon is of volcanic origin, and the beach contains so much iron that the sand, which probably is washed up, caused the magnetic needle to vibrate 21° from zero. On the West end they found a mark, probably left by the *Conway*.†

The northern channel, or entrance to the port, lying around the N.W. end of Cardon Island, has a depth of 6 to 10 fathoms. The N.W. point of the island is called *Ponente Point*, and is a detached rock. The N.E. point is *Cardon Head*, and is 30 ft. high. The channel passes round close against this point, about half a cable northward of the lighthouse; all over towards the South end of Aseradores Island the water is very shallow, and a large patch, the *Sawyer Bank*, is nearly awash.

Light.—On Cardon Head, the N.E. point of Cardon Island, is a white wooden lighthouse, 33 ft. high, showing a *fixed bright* light, elevated 64 ft., and visible 13 miles.

A reef extends 2 cables from the West point of Cardon, and a rock of 11 ft. was discovered by Commander Paynter, R.N., in H.M.S. *Gorgon*, in 1849, lying to the northward of the island. From it *leucos* Point, the South end of Aseradores Island, bore E. by N., Cardon Head, E. $\frac{1}{4}$ S., and Point Ponente, S. by W. $\frac{1}{4}$ W.

* "We established our tide-gauge on the Island of Aseradores, although directly open to seaward through *Barra Falsa*, and we were fortunate to find a good well of water close to the beach."—*Sir E. Belcher*, vol. i., p. 28.

† Pearl oysters are found near the South of Cardon; but few pearls, however, are found in them, and the search has been found very unprofitable.—*G. U. Skinner, Esq.*

A pilot will proceed to sea when a vessel is signalled off Cardon Island, and his services are compulsory if offered in good time.

CARDON CHANNEL, that North of the island, is now the only navigable entrance into the harbour. It is stated that there is only 23 ft. over the bar in the channel, at low water, when it is not considered safe for vessels drawing over 20 ft. to enter.

The mark given for taking this channel is—run toward the entrance, with Cardon Head and Icaeos Point well open of each other, until Ponente Point bears S. by W., when the course should be altered to the south-eastward so as to sail close round Cardon Head, as the current sets direct on Sawyer Bank.

The mark for entering the *Barra Falsa* was a *vigia* on a hill inland, or about 5 miles within the entrance, kept between the two points (Cape Austro and Castañon Bluff), and bearing about N.N.E. This mark kept on led into the port, but as the depth had decreased from 5 or 6 fathoms in 1838 to 2½ fathoms in 1865, it should not now be attempted.

The town of Realejo is up the channel running at the back of Aseradores Island, which is 8 or 9 ft. deep.

It is high water at Realejo, on full and change, at 3^h 6^m; springs rise 11 ft. At the outer anchorage the flood runs from N.E. to E.N.E., and the ebb the contrary, about three-quarters of a mile per hour.

The anchorage outside Cardon Island is safe only during fine weather; a large vessel should then anchor in 6½ to 8 fathoms, with the North point of the island bearing East to E. ½ N., and this is the winter anchorage for all vessels. In fine weather vessels may anchor in 4½ to 5 fathoms, sand and mud, about 1 mile W. ½ N. to W. by N. from the island.

The following are the remarks made by Mr. P. C. Allan, R.N., which will prove very serviceable:—"Vessels bound to Realejo from the southward should (passing about 20 miles to the eastward of Isle Cocos) steer to make the land to the eastward of the port during the period between November and May, as the winds prevail from the N.E., and sometimes blow with great violence out of the Gulf of Papagayo, causing a current to set along shore to the N.W.

"A range of mountains in the interior may be seen at the distance of 60 miles; the most remarkable of them is the Volcan de Viejo, the highest part of which, bearing N.E. by N., is the leading mark to the anchorage. The shore, for some distance on each side of the entrance, is low and woody. Cardon Island, which is on the right side of the entrance, is rather higher, and its western end is a brown rocky cliff. The wooden tower, or look-out house, which is situated 5 or 6 miles inland, may be seen rising above the trees.

"In coming from the southward, and running along the land, ships must avoid a rocky reef, which lies about 7 miles E.S.E. of the anchorage off Realejo, on which H.M.S. *Conway* struck. This reef was examined by the boats of that ship.

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"The two rocks that are above water (the one 8, and the other 5 ft. high) are distant from the beach rather more than three-quarters of a mile. The ground between these rocks, and $1\frac{1}{2}$ mile to seaward of them, and probably more, is very uneven. The rock on which the *Conway* struck lies S.W. by S. $\frac{1}{2}$ S. three-eighths of a mile from the N.W. or highest of the two rocks. In passing this reef, give the rocks above water a berth of 2 miles.

"The flood tide comes from the N.W. The tides are irregular; one day during our stay here it was low water 16 hours."

Mr. E. P. Brumell also says:—"In steering for Port Realejo from the southward, after passing the parallel of Port Culebra, keep the land well aboard (during the papagayos) as there is generally a strong off-set. The land is low in front, without anything to make it remarkable at 8 or 10 miles off; however, there are most excellent marks inland, in the event of not getting observations. A very high peak inland, rising evenly and gradually to a fine point, bearing E.N.E., will place you to the southward of the port, and another high mountain, El Viejo, bearing N.E. $\frac{1}{2}$ N. by compass, will place you right off the port. This mountain is very remarkable, there being none other bearing the least resemblance to it, and in fact none in the immediate vicinity."

Capt. Worth, of H.M.S. *Calypso*, visited Realejo in 1847, and the following are the remarks made from observations during his stay:—

"The breeze of Papagayo is always strong, and is felt 40 or 50 miles off shore, strongest nearest the land. Coming from Puntas Arenas to Realejo, although this breeze does not usually allow a ship to lay up for it at first, it will, as you proceed northward, draw more off shore, and lead directly up for the El Viejo Mountain, the leading mark for Realejo.

"El Viejo is an extinct volcano, and a remarkable landmark, being the westernmost of a number of conical mountains; one of which, Momotombo, is an active volcano, and almost constantly smoking, and having the appearance of a slice cut off its top, slanting to the eastward. Westward of El Viejo the land is low, with a sandy beach, thickly covered with wood; with very clear weather, and approaching El Viejo from the southward, you will see the volcano of San Miguel (extinct), making like a round island to the westward.

"Having made out El Viejo, a N.E. by N. course leads directly up to the anchorage off the entrance of Realejo Harbour; 7 or 8 miles from the beach is 19 fathoms, shallowing quickly, but regularly, to 12 fathoms, at about 4 or 5 miles from the shore. The land to the westward is a continuous low bench, wooded close down; carrying the eye along this beach to the eastward will be observed a break, the land protruding farther into the sea; the beach white, and the surf heavier, having detached trees upon it, with low abrupt cliffs, also an opening, which is the South entrance into Realejo. The island to the eastward of this opening (Castañon Island) has few trees upon it, and is abrupt at the West end. To the north-westward of it is Cardon Island, which has many detached trees upon its West end, of larger size than upon the apparent main

land (Aseradores, or Sawyer's Island), and is higher and more abrupt at this end than Custañon; there is also a large green tree jutting out from it to the westward, and a higher rock close to it, which can be seen as soon as the island itself.

"The face of Cardon Island is of a reddish-brown colour, occasioned by burning the bamboo, which grows thickly upon it. Having made out Cardon Island, the best anchorage is with its N.W. end bearing East $1\frac{1}{2}$ mile off, and El Viejo, N.E. by N., in $6\frac{1}{2}$ and 7 fathoms, sand and mud.

"No ship should anchor to the northward of the West end of Cardon bearing E. by S., as the soundings shoal very quickly from 6 to 5 and $4\frac{1}{2}$ fathoms, the rise being about 11 ft., and always a swell, sometimes very heavy, the ship rolling deeply; nor is the bottom so good when nearer the beach.

"At the commencement of the dry season, the land-winds frequently last for several days together, blowing very fresh, and preventing ships from entering the harbour; but, as the season advances, the land and sea-breezes become more regular, but never strictly so. Sir E. Belcher's plan of Realejo is very correct, though there did not appear to me quite so much water near the East end of the North side of Cardon as laid down on it. The entrance is narrow, making it necessary to pass close to the tree on the West end of Cardon Island. A pilot takes vessels in and out. When leaving the harbour, you should have a commanding land-wind, as the ebb sets directly across the South entrance, and very strong.

"The *Calypso* was awkwardly situated; the land-winds failing us, we drifted down towards Cardon Island, and were obliged to anchor and warp against the tide into deeper water; the anchor was let go in $3\frac{1}{2}$ fathoms, but it soon shoaled to less than 3 fathoms.

"The proper anchorage, which is nearer the Island of Aseradores than the opposite shore, is confined; the bottom soft mud; consequently, should a vessel take the ground, no damage would occur. A large frigate would find considerable difficulty in swinging here.

"Realejo is healthy during the dry season (November to April), but subject to fever and ague during the rainy season, which commences in May. Water can be had, but not very good, and is very dear: the natives fill the casks out of the river at low water, a little above Realejo."

The conspicuous tree near the North end of Cardon Island was destroyed by a storm May 23rd, 1876, but another tree, planted in 1872, now forms a good mark.

Dampier, who was on this coast in September, 1685, says:—"We had very bad weather as we sailed along this coast; seldom a day passed but we had one or two violent tornadoes, and with them very frightful flashes of lightning and claps of thunder. I never did meet with the like before nor since. These tornadoes commonly come out of the N.E. The wind did not last long, but blew very fierce for the time. When the tornadoes were over we had the wind at

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Manzana Island, or *False Cardon* (known to the native pilots as *Aseradores Island*), is at the N.W. end of *Aseradores Island*, which does not appear to be an island as you sail past it in 11 fathoms. Manzana is only about 18 ft. high, covered with trees, whose level tops can be seen at 8 miles off, and the island has a white beach. It is nearly joined to *Aseradores Island* at the South end by a very shallow channel. Several wrecks have occurred from mistaking this island for the true Cardon, but this error should not occur if the mountains are visible. El Viejo bears E.N.E. from Manzana, and N.E. by N. from the latter. Should El Viejo be hidden by clouds, which sometimes occurs, the regular cone of the Telica volcano to the S.E. of it, which is rarely obscured, will equally serve, for it bears nearly East from Manzana, and nearly E.N.E. from Cardon. Rocks extend a long distance seaward of the island.

The coast pursues a straight line to the *Mesa de Roldan* (Roland's or the Round Table), the seaward extremity of a small chain of hills, which is easily known by its level summit, and by the large reddish patches on its slopes, where they are not covered by trees. Between Cardon and this the bottom is very even, with a depth of 13 or 14 fathoms at 6 miles from the beach.

Speck Reef lies about 7 mile N.W. by W. from False Cardon, and is said to stretch 3 miles from shore, with 15 ft. on its outer edge. It consists of two rocky shoals, half a mile apart, there being a depth of 6 fathoms in the channel between them, in which the French surveying vessel *L'audreuil* anchored, in 1872. The outer reef is named *Seguedad de Petacaltepe*, and is extremely dangerous, as at half tide, with a heavy swell, it does not break, though the sea breaks furiously on the inner reef at that time. The pilots state that at low water springs three small rocky pinnacles are awash on the outer reef.

North-westward of the *Mesa de Roldan* the coast is a sandy beach, so low that it cannot be seen from the deck when in $4\frac{1}{2}$ or 5 fathoms. It curves around to the N.W., and then it rises into perpendicular cliffs, which continue to the famous and terrible volcano of Coseguina, at the entrance of the Gulf of Fonseca. In sailing between Realejo and Fonseca there is no danger, with the exception of Speck Reef, if you do not come into less than 5 or 6 fathoms. Near to the Coseguina it may be approached within a mile, but with the flood tide it is better to keep farther off, on account of the inset into the Estero Real.

The GULF of FONSECA, or *Conchagua*, is about 40 miles N.W. of Realejo. It is an extensive and fine bay in the Pacific, almost unrivalled for its extent, its beauty, or its security. Though generally known by the name of the Gulf of Fonseca, it is also known by the names of *Conchagua*, *San Carlos*, *Amapala*, *Coseguina*, and *Amatapala*. Its shores are divided among the States of Nicaragua, Honduras, and San Salvador; its beautiful volcanic islands belong only to *North Pacific*.

the two latter. Honduras possesses Amapala or Tigre, Sacate-grande or Velasquez, Guaguensi, and Disposicion, while Conchagua, Manguera, Martin Perez, and Punta-Sacate belong to San Salvador.

Each of the states claiming part of its shores have opened a port to commerce. That of San Carlos de la Union, belonging to San Salvador, is the most important, not on its own account, but because of its proximity to the city of San Miguel, which at the time of its fairs (in February and November) is the most commercial place in Central America.

The port for Honduras, called *San Lorenzo*, is on the river Nacomo; it will only receive vessels of very light draught, and is seldom visited except by bongos. But the Honduras Government, at the instance of M. Dardano, the Sardinian Consul, has declared the anchorage at Amapala on Tigre Island to be a free port, with the hope of attracting hither, from its central position and capabilities, an entrepôt of the commerce of the gulf.

Nicaragua has its port of entry on the left bank of the Estero Real to the S.W. It is merely a post occupied by a few soldiers at Playa Grande. It is rarely visited, and quite unimportant.

The inter-oceanic railway across the State of Honduras was proposed to terminate on the northern shore of the gulf. It starts from Puerto Caballos or Cortez, in the Bay of Honduras to the northward, running nearly due South to Punta Remolina on Sacate-Grande, or some other point in the Gulf of Fonseca. The total length between the anchorage in each port would be 148 geographical miles. It was surveyed in 1858 by Colonel Trautwine, and verified by Colonel Stanton, R.E. It was proposed also to extend the southern terminus to Tigre Island by a pile bridge $1\frac{1}{2}$ mile long. Either this or the main land fronting the Bay of Chismuyo, or else the Island of Garova or La Union, might be a terminus. The railway has since been constructed from Puerto Cortes as far as San Pedro, a distance of 37 miles.

Mr. E. G. Squier says:—The entrance to the bay, from the sea, is about 19 miles wide between the great volcanos of Conchagua (5,720 ft. in height) and Coseguina (3,800 ft.), which stand like giant warders upon either hand, and constitute unmistakable landmarks for the mariner. On a line across this entrance, and about equi-distant from each other, lie the two considerable islands of Conchagua and Manguera, and a collection of high rocks, called *los Farallones*, which, while they serve to protect the bay from the swell of the sea, divide the entrance into four distinct channels, each of sufficient depth of water to admit the passage of the largest vessels. These islands are high, Conchagua being not less than 500 ft., and Manguera about 600 ft. in height. They were formerly inhabited by Indians, who withdrew to the main land to avoid the oppressions of the freebooters during the period of their ascendancy in the South Sea. Both of these islands belong to San Salvador.

Of the islands previously named, Velasquez, or Sacate-grande, is considerably the largest, and, in common with the others, is of volcanic origin. It is 5 miles

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long, by about 4 in breadth. The southern half is elevated, rising in a number of peaks to the height of 2,200 ft. These elevations slope off gently to the northward, and subside finally in level alluvial grounds of exceeding fertility. These, as well as the slopes descending toward them, are densely wooded with cedar, mahogany, willowist, and other valuable trees. The peaks themselves, as well as their most abrupt southern slopes, are covered with grass, called by the Indians *sacate*, whence this island derives its name. These grassy slopes afford pasturage for great numbers of cattle, and it is said that as many as 4,000 have been pastured upon the island at a single time. For most of the year, and except in very dry seasons, there are running streams of water on the northern slopes of the island. Abundance of water, however, may be obtained by digging through the upper lava crusts, beneath which, as is frequently the case in volcanic countries, flow constant streams. The grassy peaks of Sacate-Grande, as well as of the other islands, afford a source of ever-varying and eternal beauty. With the commencement of the rainy season, they are clothed with the delicate translucent green of the springing grass, which deepens as the season advances, both in colour and thickness, until all the asperities of the ground are matted over with an emerald robe of luxuriance. Then, when the rains cease, and the droughts commence, the grass becomes sere, and finally of a brilliant yellow; and the islands appear as if swathed in a mantle of golden grain, which Ceres herself might envy. Then comes the torch of the *vaquéro*, which clears the ground for the future fresh and tender blade, but leaves it browned and purpled, in sober contrast with its previous gayer garniture of gold and green.

The island of Gueguensi may be regarded as a dependancy of Sacate-Grande, from which it is separated only by a narrow and shallow strait. It has a single eminence of great beauty and regularity. The rest of the island is level, chiefly savanna, fertile, and well adapted to the cultivation of rice, cotton, and sugar. It is fringed by a narrow belt of mangroves.

The Island of Tigre, from its position, is the most important island of the bay. It is about 10 miles in circumference, rising in the form of a perfect cone, to the height of 2,590 ft. The slope from the water, for some distance inward, is very gentle, and admits of cultivation. Upon the southern and eastern shores, the lava forms black, rocky barriers to the waves, varying in height from 10 to 80 ft.; but upon the northward and eastward there are a number of "playas," or coves, with smooth sandy beaches. It is facing one of the most considerable of these that the port of Amapala is situated. The water in front is deep, with clear anchorage, where vessels of ordinary size may lie within a cable's length of the shore.

Coseguina Point is the S.E. point of Fonseca Bay, and near it stands the celebrated volcano of Coseguina, 3,800 ft. high, in lat. $12^{\circ} 58'$ N., long. $87^{\circ} 34'$ W. It was anciently called Quisiguina. The verge of the crater is half a mile in diameter, and thence the interior walls fall perpendicularly to a

depth of 200 ft., when the bottom of the crater becomes flattish, with a small transparent lake in its centre. One of the most remarkable volcanic eruptions on record occurred from it. It commenced on the 20th of January, 1835, and its first evidence was, as seen at 60 miles distance, an immense column of smoke and flame emitted from the crater. At 9 a.m. a very heavy shock of an earthquake was felt; the night following, five shocks; and during the 21st, "several shocks, accompanied with the noise resembling distant thunder, or "*retumbo*," as the Spaniards call it. On the 22nd, the ground was covered with fire, ashes, or sand, darkness and the roar of the volcano prevailing. On the 23rd, the fall of ashes and noise increased till it became darker than the darkest night, and continued so till 3 p.m., when it cleared a little; everything was covered thickly with the volcanic dust, the noise, and odour of sulphur, being overpowering. Its devastating effects were continued for many weeks after.

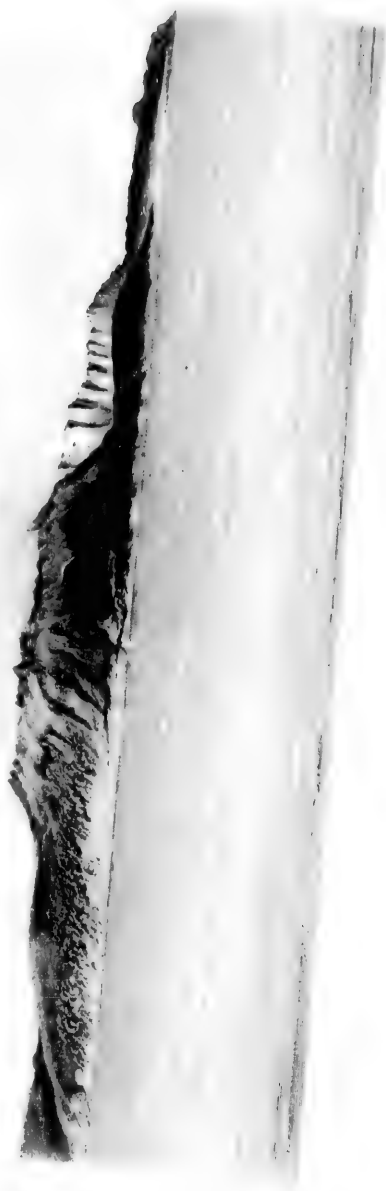
In proof of its tremendous effects, the eruption shook all the windows and doors in the city of Guatemala, which is between 20 and 250 statute miles distant, most forcibly. This was occasioned, not by the earthquake, but by the explosions transmitted through the air; this was on January 23rd, 1835. But the distance to which the thunder of the volcano was heard, and the dust felt, was very much greater than this. According to the official account, these were both felt and heard at Ciudad Real de Chiapas, a distance of 420 geographic miles. It occasioned very great alarm at Tonalá and other parts in Soconusco, 450 miles to the N.W.; and on the coast about Mérida, in Yucatan, 800 miles off. Those to the southward were not slight evidences, but the air was darkened, and the noises terrific, and the sulphureous vapours most suffocating. The flocks perished from the pastures being destroyed by the dust, and great sickness ensued among all from the water becoming tainted from the same cause.

In the "*Jamaica Watchman*" (January 29, 1835), too, it is announced that all the ships about that island were covered with the fine volcanic dust, which continued to fall for some days, covering everything.

G. U. Skinner, Esq., left the city of Guatemala and Istapa in the middle of March, passing large banks of floating pumice during the passage to Conchagua. When at many leagues distance, they were almost suffocated by the sulphureous vapour and the volcanic dust, which obscured the sky, and settled on everything, causing most violent burning pains in the eyes.

PORT LA UNION is an inner harbour or bay of the Gulf of Fonseca, and lies on the North side, around Chiriquin or Chiearene Point, extending 8 or 9 miles inland, but the upper and N.E. sides are shallow and uncovered at low water. This contracts the limits of the port within much smaller dimensions. On these flats oysters are very abundant.

The town, formerly known as *San Carlos*, or *Conchagua*, is situated on the South side of the port. The site is badly chosen, as the difficulty in landing is at all times great, and at low water nearly impossible; during strong northerly



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winds the communication is frequently out off for days, independent of unsafe holding ground for shipping. Near Chiriquin this might have been entirely avoided. It is proposed to construct a mole, 300 ft. long, to improve the communication. The port is entirely landlocked; in fact, a complete inland sea. The actual town or village of Conchagua, from which this port derives its name, is situated about 3 miles up the Amapala Mountain, or extinct volcano, immediately over the port. A railway has been projected to run from La Union through the central part of the state of Costa Rica.

Light.—A *fixed bright* light, elevated 33 ft., and visible 8 miles, is shown from the Commandant's house, at the inner part of the landing wharf.

If proceeding to La Union, and having made out the entrance and the islands, steer direct for the island Conchagueta, which may be ranged close-to, so as to avoid the shoal water near the mouth of the San Miguel River, and over which the flood runs strongly. If obliged to beat in, there will be no difficulty in doing so, guided by Sir Edward Belcher's plan, or without it by the lead. You should not come into less than $6\frac{1}{2}$ or 7 fathoms near the hill forming the second point, on the port hand, in entering, called Point Amapala, to the North of which is the mouth of the San Miguel, and which ought to be kept at $1\frac{1}{2}$ mile distant. Before arriving abreast of the North point of Conchagueta, steer rather within Point Chicarene (or Chiriquin), so as to range the shore formed by the slopes of the Amapala volcano. The depth is greater than nearer the islands, and you will have the advantage of the flood stream, which separates into two branches to the North of Conchagueta, one following the channel, the other diverging to the N.E. A Sardinian vessel was driven on to the Negritos from want of knowing this fact.

Having doubled Point Chiriquin nearly in mid-channel, an extensive bay opens, the North part of which is filled with mud-banks, which uncover at low water. A large ship should anchor before having the North point of Punta Sacate bearing East, in $5\frac{1}{2}$ to $6\frac{1}{2}$ fathoms, mooring to the flood and ebb. Vessels of less draught may get nearer to the village, which is 4 miles from the above anchorage, by keeping to the shore on the port hand, after rounding Point Chiriquin, and anchor at 1 or $1\frac{1}{2}$ mile N.E. of the town, in $3\frac{1}{2}$ to $5\frac{1}{2}$ fathoms, bottom of mud, and excellent holding ground, allowing room to drive in case of the North winds, which sometimes blow with great force. Vessels of 400 tons usually anchor at 2 miles S.E. of the town.

If it is not intended to stay long here, or only to procure water or provisions, you may stay in the channel between Point Amapala and the islands Conchagueta and Punta Sacate, a little to the South of the watering place of Chiriquin, keeping as much as possible within the direction of the point, to avoid the strength of the current, and the cross sea, occasioned by the sea breeze opposing the ebb tide. You should moor North and South.

The tides are regular, their velocity rarely attaining to 2 knots, except be-

tween Point Chiriquin and the Negritos. It is high water, on full and change, at 3^h 15^m; range at springs, 12 ft. 2 in.; at neaps, 8 ft. 10 in.

The mud bank in front of the landing place dries out more than a cable's length at low water; it is better then to use the native canoes to pass through this liquid mud. A jetty has been constructed to avoid this inconvenience.

If proceeding to *Amapala* (or *Tigre Island*), steer for the steep-sided channel between Manguera and Conchaguita, closing in with the N.W. point of the first of these islands to within 3 or 4 cables' lengths, so as to bring the second hummock of the summit of Tigre Island, or rather the part where the "sacate"* joins the trees, to bear about N.E. $\frac{1}{2}$ E., the depth being from 11 to 13 fathoms. As soon as that bearing comes on, steer for it, and the lead will show a bank of sand and mud, the depth on which gradually decreases from 13 to 4 or 4 $\frac{1}{2}$ fathoms, which is the shoalest part of the channel. As soon as Caracolito, a low islet, covered with bushes and scattered trees, bears N.N.E., and clears well from Tigre Island, though it is connected with it at low water, steer N.N.E. $\frac{1}{2}$ E. towards a small cabin or rancho, on the sandy beach to the right of Caracolito, approaching it till it bears N. by E., and then pass around it at the distance of 2 cables' lengths from the white house, and then the harbour will come in view, when you may anchor at 4 cables' lengths off the sandy beach, the flagstaff bearing S. 32° E., or a white house with three doorways S. 39° E., being then in 8 fathoms, green mud, and of excellent quality for holding. The shoal lying 4 cables N.W. of the N.W. point of Tigre Island is marked by a white buoy.

Amapala is more frequented than La Union, and provisions are more easily obtained here. Water is procured from the wells, which are private property. Indigo, cattle, hides, and wood, are the principal exports; lighters are used for landing or loading cargo, and it is proposed to construct a pier. The climate is generally healthy, and the population is about 1,100.

The *Estero Real*, in the southern part of the gulf, appears to be of considerable importance, as Sir E. Belcher took the *Starling* up it for 30 miles from its mouth, and might easily have gone farther, but the prevailing strong winds rendered it too toilsome a journey at this period; he considered that it might be ascended much higher—the natives say 60 miles—by vessels drawing 10 ft., but steamers would be absolutely necessary to tow against the prevalent breezes.

According to Sir Edward Belcher's opinion, this unquestionably is the most

* Sacate is the term applied to those rare spaces, bare of trees, but covered with a species of long grass, called *sacate*, which, during the dry season, is of the colour of the ripe corn field of Europe. This grass is burned just before the rainy season commences, and then has a red and sterile appearance. Soon after the first rains, it assumes a pale green, which looks like a plantation of sugar-canes.

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Mr. G. U. Skinner says that there is considerable traffic carried on by means of bongos, or large canoes, and that the distance from the embarcadero to the Conchagua is 65 miles.

Capt. Worth says:—Leaving Realejo for Conchagua, with the land-wind, it is advisable to steer obliquely off shore to meet the sea-breeze, which takes a ship to Coseguina Point, on the East side of the Gulf of Conchagua. Sailing in the morning, you will generally reach this point late in the evening, or the next day after noon.

The Gulf of Conchagua will be well understood by reference to Sir E. Belcher's plan; there appear to be no dangers. The *Calypso* worked in and out twice, tacking at less than 2 cables' lengths from the shore and islands.† The tides are very strong; full 2 knots at full and change, which takes place at 3 p.m. About the change of the moon the land-wind blows strongly during the night, and a greater part of the day; you can, however, see it coming by the foam on the water.

As in coming from Realejo you generally arrive here in the evening, it is advisable to anchor when the land wind comes off; for, should you be driven off the coast, it will take all the next day to reach the islands, and to arrive at the proper anchorage, the sea breeze being weak after such strong land winds.

In the *Calypso*, on our first going to Conchagua, the land wind came down with such force that the gulf appeared to break across; and we anchored in 18 fathoms, and worked up the next day to Chiquirin Bay.

This gulf contains the best and most easily obtained water on the coast; it is a stream running down the mountains, clear and sweet, into the bay called

* Sirano, Siriano, or San Miguel River, has been one of the sites thought of for forming the communication between the two oceans, to be connected with the Bay of Honduras, through the transverse valley, the Llanura de Comayagua, watered on the Atlantic side by the Jagua, and on the Pacific by the Sirano, as before mentioned, and both of which are navigable, but how far, or how long, our knowledge will not determine. This scheme, therefore, is very desultory.—*L'Isthme de Panama*, par M. Chevallier, p. 72.

The town of San Miguel is situated on a plain at the base of the volcano, which is 7,024 feet high, and suddenly springs on this side to its apex, and is surrounded on its other sides by ranges of 500 to 600 ft. above its level, entirely excluding it from any prospect beyond their outlines. There is nothing in the city itself which calls for remark, and its consequence arises principally from the fairs held here for the purpose of transacting the indigo trade. The fair at the period of Sir Edward Belcher's visit is the principal (November 25, 1858), and had a large quantity of cattle, horses, sheep, &c.

† In entering the gulf from the westward, bring the Island of Tigro to bear exactly between the Islands of Conchaguina and Manguera, to avoid the rocks off Point Candadillo. Tigro is a high conical hill. It is thus quite safe entering to an anchorage, even at night, if this island be seen, which is seldom not the case at all seasons.—G. U. Skinner, Esq.

La Playeta de Chiquirín, which is just to the southward of Chiquirín Point. You can anchor close in. The best way to water is by rafting, the water in the bay being quite smooth, you can pull well to windward, and alongside to the eddy, and then across the tides to the ship. We filled 26 times a day, although badly off for boats, having only a 28-foot pinnacle. There is a surf on this beach, sometimes heavy, but seldom enough to prevent landing. Merchant vessels anchor so close, as to be able to hand their casks off with long lines. When we first anchored in this point we tried, through ignorance, to water in the Playa de Chicarené, but we found the surf so heavy, the water so bad, and such great difficulty from the tides, that we could not get more than 18 tons a day, and that after great labour to the men, and much damage to the casks and boats.

Wood is not so cheap here as at Realejo; beef about the same price, also washing; but stock is dear, and difficult to get in any quantity; turtle is plentiful, about 2 reals for one weighing 50 lbs. Sir Edward Belcher's plan clearly shows the only dangers in entering Port La Unión; they are visible at low water, the only difficulty is the very great strength of tide; it is quite a sluice round Chicarené Point.

4. SAN SALVADOR.

San Salvador is the smallest of the Central American Republics, but relatively to its extent, it is the most densely populated, and has the most industry and commerce. It extends from the North side of the Gulf of Fonseca to the Rio Paza or Pazaca, about 160 miles to the westward, which separates it from the Republic of Guatemala. Its population is estimated to amount to about 550,000. It is an agricultural state, and the principal products are coffee (the chief article), indigo, sugar, and tobacco. Indigo, produced from an indigenous plant, the *jiquilite*, is easily raised and manufactured. The coast presents, generally, a belt of low, rich alluvial land, varying in width from 10 to 20 miles. Behind this, and presenting an abrupt face seaward, is a range of mountains, or rather a broad plateau, having an average elevation of about 2,000 ft. Along this plateau there are not less than eleven great volcanos, running in nearly a direct line from S.E. to N.W., coincident with the great line of volcanic action, which is traceable from Mexico to Chile. Its principal stream is the Lempa, which would be navigable for small steamers for probably 100 miles, but it is hopelessly barred from seaward. The chief ports, if such they can be called, with the exception of the fine harbour of La Unión, are Acajutla and Libertad, mere open roadsteads, only deriving their existence and importance from their proximity to the respective cities of San

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Salvador and Sonsonate. Another place, *Concordia*, has been formed to the westward as a port to the town of San Vicente.

We have no proper survey of the coast; but as it has only to be known to be avoided, this want is of the less importance. The "ports," or anchorages, are only of interest.

In general, the inhabitants of Salvador have more intelligence and industry than those of the previously described States of Central America. Their government is more liberal, and the rights of person and property are more respected, and the privileges extended to foreigners are greater than those above-mentioned, under a treaty negotiated by Mr. Squier, United States Minister to Salvador, in 1850. The chief towns are connected by telegraph.

The commerce of San Salvador is chiefly carried on through means of fairs established by the government in the districts best suited for the exhibition of the products of the State. The principal fairs are held at Chalatenango, San Vicente, and San Miguel. The two former take place on the 1st of November in each year; the latter, called "Fair of La Paz," on the 21st of the same month. It lasts about two weeks, and is far the most important of any held in the country. It attracts buyers and sellers, not only from all parts of Central America, but from nearly every part of the Pacific coast, as well as from England, Germany, France, and the United States. About the only products given for the goods sent in by foreigners are the staple of the state, coffee and indigo. A second fair, called "Ceniza," takes place in San Miguel about the beginning of February. To both of these fairs large numbers of cattle are brought from Honduras and Nicaragua.

In 1882 the value of the exports amounted to 5,110,929 dollars, and the imports, chiefly cotton goods and provisions, 2,856,861 dollars. Coffee is the chief article of export, the value of that exported in 1882 amounting to 2,700,804 dollars. The export of indigo, which formerly held the first place, amounted to 1,295,550 dollars in the same year; under the Spanish rule the value of this article amounted to 3,000,000 dollars per annum.

The Coast, as delineated in the chart, is chiefly taken from the survey of Don Alessandro Malaspina, in 1794, as drawn up subsequently for the Spanish Government by Don Felipe Bauza, F.R.S. In the introduction to the next chapter we have noticed the unfortunate voyage of this commander, and have there stated the reasons why we have not a more complete description of the tract he explored. A running sketch of the coast between Amapala Point and Libertad was made by Lieut. Chambré, H.M.S. *Fantome*, in 1876.

From *Candadillo* or *Amapala Point*, the western limit of the Gulf of Fonseca, the coast is low and sandy for some distance, and then becomes higher, and in some places clifty, for about 10 miles to where San Miguel volcano bears N. 18° E., when it again becomes low and sandy to Jiquilisco and Libertad. These low beaches, particularly at sunrise and sunset, occasion such a strong

North Pacific.

mirage, that it appears as if the surf breaks much farther off than it does in reality. The soundings off this shore are regular, and increase gradually toward the offing, contrary to the opinion that the bottom is very uneven and dangerous to navigate by the lead; but it may be affirmed that a vessel will be in safety anywhere between Fonseca and Point Remedios, so long as she is in more than 8 or 10 fathoms, and, in a calm, she might anchor, as the currents are variable. A more general remark may also be made, that on the whole coast of Central America, the lead will be a good guide, and that the depth above stated is generally safe, except in some places, where it would be too near the land, and 13 to 18 fathoms is a better depth to maintain.

PORT JIQUILISCO, or *Jiquilisco*, or *del Triunfo de los Libres* (according to Colonel Don Juan Galindo, an Englishman in the service of the Republic), is about 32 miles beyond Candadillo, the N.W. entrance point of Conchagua.

In 1798, the Royal Consulate of Guatemala ordered Don Vincente Rodriguez del Camino to survey it. He states that it was then named the *Bay of San Salvador de Jiquilisco* (a species of plant, the *indigofera disperma*), anciently called the Bay of Fonseca. May this account for the double name applied to Conchagua to the S.E.? The name given to it by Colonel Galindo evidently has reference to one of those "triumphs," so common and so ephemeral in these distracted countries. We have therefore preferred the old name.

According to the old plan of Don V. del Camino, the anchorage is good and well sheltered. Like Tehuantepec, the coast of the main land appears to be fronted by a long narrow island, perhaps formed by the tremendous surf raised by the prevalent winds. Shoals extend about 4 miles seaward of Arena Island. A dangerous shoal is marked on some charts as lying 9 or 10 miles off the coast, S.S.W. of Jiquilisco; M. Lapelin searched for it without success in 1852, and the commander of the *Vaudreuil* could not find it in 1872, and it is considered not to exist.

Commander Philip, U.S.S. *Tuscarora*, has examined the shoal extending off the entrance of the port in the form of a horse-shoe from side to side. At high water, in calm weather, the bar is smooth, but breaks at other times. Just outside the breakers San Miguel volcano bore N. 26° E., San Vicente volcano, N. 43° W., and San Salvador volcano, N. 55° W. Mariners are cautioned not to approach the shore within 6 miles, when navigating in this vicinity.

"The port, or rather the creek or 'Estero' of Jiquilisco, has not the same appearance as the rivers, &c., to the West; instead of mangroves, the shore is marked by bushes of a pale green or muddy colour, or else without leaves. The volcano of San Miguel, kept on the bearing of N. 27° E., will lead on to the horse-shoe breakers. At 1½ mile off the water is much discoloured, but the depth is 7½ and 8½ fathoms, fine grey sand, which would not hold well; a better anchorage would be 1½ mile West of the bar, where there is an adhesive mud, and black sandy bottom. We were not fortunate enough to

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find the channel across the bar, described by the officers of *Le Génie*, as stated below."—*M. Lapelin*.

"The bar of Jiquilisco forms a sort of horse-shoe, which must be crossed to enter the estero. The sea frequently breaks heavily on it, but there are places where it does not do so, and where it may be easily attempted in boats. There is 14½ ft. least water on one part, and the tide rises 8½ ft.; it is therefore possible even for ships of considerable burden to clear this line of breakers, which is but narrow, and find plenty of water within, except on three or four small shoals, which are not difficult to avoid. One feature of the place, which will point out the channel, is that the ebb tide from the estero forms a line of eddies or rippings in which there is always deep water, and which crosses the banks in the deepest part. This current turns with the tide, and sometimes runs at the rate of 3 miles an hour, and with the flood tide makes a very heavy sea on the bar, except at the time of high water."—(*Capt. Jamin*, of the brig *Le Génie*). At the entrance of the estero is *Pajaros Island*, which separates it into two channels, in which it is said there is a depth of 8 fathoms.

The **RIVER LEMPA, or LAMPA**, runs within 3 miles of one of the arms of the estero of Jiquilisco, and the inhabitants state that another branch joins the River San Miguel, which falls into the Gulf of Fonseca.

In passing along the coast near this river the navigator should be very cautious of his distance, for it is stated that a long bar or flat runs off, as indeed might be anticipated, from the magnitude and character of the river. This flat, which reaches the greater part of a mile, is called the *Barra del Espiritu Santo*, and on it the *Lucretia*, a brig drawing 12 ft., was wrecked, February 18, 1847. This was in consequence of the ignorance of the existence of such a projection.

In Father Gage's work, before quoted, he mentions the Lempa:—"This river is privileged in this manner, that if a man commit any heinous crime, or murder, on this side of Guatemala and San Salvador, or on the other side of St. Miguel or Nicaragua, if he can flee to get over this river, he is free as long as he liveth on the other side, and no justice on that side whither he is escaped, can question or trouble him for the murder committed. So likewise for debts, he cannot be arrested."

Among the many undeveloped resources of San Salvador, *coal* may come to have a first value. Mr. Squier says that there is reason to believe that vast beds exist throughout the valley of the Rio Lempa, and in the valleys of some of its principal tributaries, over a region 100 miles long by not far from 20 miles broad. It had long been reported to exist, but he set the question at rest after his visit in 1853, by proper investigations. Coal was found in the valley of the Rio Titiguapa, flowing into the Lempa from the coast, also in the valley of the Rio Tordila, and large beds are reported to exist near the town of Itobasco. The coal is all of the variety called *brown coal*, and is a later formation than

what is known as pit coal; similar coal is extensively used in Germany for various mineral purposes.

The entrance to the Lempa River is similar in character to the others West of it. It is known by some large trees with white trunks, with the tops almost bare, rising above the lighter coloured and lower wood, similar to the copse-wood of northern countries. It is found when coming from the East or South, by bringing San Salvador to bear N. 50° W., or San Vicente N. 16° W., and then running on either of these bearings will bring up to the bar. Coming from the westward, San Miguel bearing N. 60° E., will bring you up to it. The entrance is about half a mile broad, barred by breakers, which reach a mile off, and which the natives say cannot be taken. It is quite unimportant, and there are only a few fishing huts on its left bank.

Above this port and the mouth of the river the *Volcan de San Miguel* rises. It is 6,822 ft. high, and is a very conspicuous object in the offing, and will serve well to point out the locality.

La Concordia, a "port" of late growth, for the town of San Vicente, is at the mouth of the *River Jiboa*, 11 miles W.N.W. of that of the Lempa. This river drains the Lake of Itopango, but we have no particulars of the anchorage, and its position appears to be in doubt, the survey by Lieut. Chambré placing it several miles farther to the westward.

PORT LIBERTAD is about 33 miles to the W.N.W. of the Lempa. It was visited by H.M.S. *Sulphur*, and we give her commander's observations on it.

One would naturally expect from this title that something pretending to a bay, or deep indentation at least, would have warranted the appellation. But a straight sandy beach, between two slightly projecting ledges of rock about a mile asunder, forms the *plaza* of Libertad. It is *law* and *interest* only that have made it a port.

At times the bay is smooth, but the substratum at the beach being of large smooth boulders of compact basalt, the instant the surf rises they are freed from their sandy covering, and a dangerous moving strong bottom left, on which the boat grounded. We were informed that it is generally violent for three or four days, at full and change, which corresponded to the time of our visits.

The rollers which set in on this beach curl and break at times in 4 or 5 fathoms, at least a quarter of a mile off. Those within, which are the most dangerous, are caused by the offset or efflux. The sand beach is composed chiefly of magnetic iron sand, the dried superstratum, about one inch in thickness, caking in flakes free from admixture.

The anchorage is uneasy, and I should think unsafe, and should be avoided near the full moon. Sudden rollers come in, which are apt to snap chain cables, unless with a long range.

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Lampier, vol. i., pp. 225-

Poultry, bullocks, &c., are to be obtained, but the prices are exorbitant. Bullocks can only be embarked in one of their bongoes.

The port, after Commander Belcher's visit, was for a long time deserted, but when Capt. de Lapelin came here in 1852, it had been reinstated, and the custom-house stores rebuilt. A launch was also maintained, going out and returning by means of the andarivel. The mark for approaching it is to bring the volcano of San Salvador to bear N. $\frac{1}{2}$ E., which bearing will lead up to it. An iron pier has lately been constructed for landing and shipping cargo, and the telegraph cable connecting Mexico with Panama has a station here. A white building on the extremity of the mole is conspicuous from sea.

When at 8 miles off the depth will be about 25 or 27 fathoms, muddy bottom, which depth will gradually decrease towards the shore. At about 6 miles off you will begin to make out the large storehouse covered with tiles, and with whitewashed walls, having a flagstaff to the East, and a white house to the West; when nearer you will see the tops of the palmetto trees and some huts. When a mile off the place the depth will be about 8 $\frac{1}{2}$ fathoms. Water may be got, though with difficulty, from the little *River Quelama*, which falls into the sea at less than half a mile West of the village. Capt. de Lapelin adds his opinion that this place should not be frequented between July and October.

When the mail steamers are expected a *fixed bright light*, visible 6 miles, is shown from a lantern at the custom-house. It is obscured by a building when bearing between N. by W. and N.W. by N. $\frac{1}{2}$ N.

San Salvador, the capital of the republic, is to the N.E. of Libertad. They are connected by a cart road 26 miles long, but a company was formed, in 1884, to construct a railway between them, 33 miles in length, by way of New San Salvador.

Sir Edward Belcher visited this city in April, 1837, going thither from Realejo, the road being through a very mountainous tract. The town is very prettily situated on a level plain, or amphitheatre, from which several lofty mountains rise, that of the Volcan de San Salvador being the most conspicuous.* San Salvador was the capital city of the confederation of the

* When we first saw the mountain of Guatemala, we were, by judgment, 25 leagues' distance from it. As we came nearer the land it appeared higher and plainer, yet we saw no fire, but a little smoke proceeding from it. The land by the sea was of a good height, yet but low in comparison with that in the country. The sea, for about 8 or 10 leagues from the shore, was full of floating trees or drift wood, as it is called (of which I have seen a great deal, but nowhere so much as here), and pumice stones floating, which probably are thrown out of the burning mountains, and washed down to the shore by the rains, which are very violent and frequent in this country.

The Volcan of Guatemala is a very high mountain with two peaks or heads, appearing like two sugar-loaves. It often belches forth flames of fire and smoke from between the two heads, and this, as the Spaniards do report, happens chiefly in tempestuous weather.—

Lumpier, vol. i., pp. 225—230.

States of Central America, and, in imitation of Washington in the United States, it had a Federal district assigned to it, which included the Port of Libertad, but this confederation was dissolved in 1839. It was a very handsome city, of 25,000 inhabitants, with fine churches and public buildings; but on April 16th, 1854, at 10 minutes to eleven, such a terrific earthquake occurred almost without the slightest warning, that in ten seconds the entire city was thrown into heaps of ruins. It was then nearly deserted, and the seat of government was removed to Cojutepeque, about 12 leagues distant. It was again entirely destroyed in 1873, but is now rebuilt.

The COAST between Libertad and Acajutla is very uneven, covered with trees, or with reddish-coloured barren patches. On the sea it forms cliffs, bordered by a beach of shingle. It is, however, said to be quite clean, and may be approached within view of the breakers.

A district along the coast, between the Ports of Libertad and Acajutla, is called the *Costa del Balsamo*; it produces an article known commercially as the Balsam of Peru, from its having been sent to Lima for export to Europe. It is collected solely by the aboriginal Indians who inhabit that district. About 20,000 lbs. were obtained for annual export.

Point Remedios has a reef off it, said to extend in a south-westerly direction nearly 3 miles, but later observations state that it extends less than 2 miles in a southerly direction. In fine weather this reef scarcely shows itself, therefore more caution is necessary in rounding it. Vessels of a light draught have frequently passed safely over the outer part of it unknowingly, whereas several others, less fortunate, have been brought up by detached rocks, and a total wreck has ensued. The point is long and low, thickly wooded, and from the eastward easily recognized.

PORT ACAJUTLA, or Sonsonate Roads, is the next attainable point beyond Libertad. The principal town of this port is Sonsonate,* which is situated about 15 miles inland, and is connected with it by a railway, opened in July, 1882, and now being extended to the important town of Santa Ana, in the interior. There is also a small town of about 600 inhabitants on the coast, which gives its name to the port; the houses are of various descriptions, most of them of the meanest order; they are constructed of bamboo open work at

* Sonsonate, or Zonzonate, derives its name from the Rio Grande, formed by almost innumerable springs of water, to which the name of *Zozontlati* is given, a Mexican word meaning 400 springs, corrupted to Zonzonate.

"Santissima Trinidad de Zonzonate is situated on the Rio Grande. It is a pleasant town, although the climate is very hot. Each of three monastic orders have (had) a convent here. The church is very spacious, besides which there are three oratories. On the opposite side of the river it has a suburb called the Barrio del Angel, on which there is a chapel. The communication between the town and the suburb is by means of a stone bridge. In the vicinity are three small Indian villages, &c."—*Don Dom. Juarros: Translation by Mr. Baily, p. 28.*

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the sides, and the top is rudely thatched with palm leaves, which latter is, however, made impervious to the heavy rains that fall almost perpendicularly in the wet season. The tile-roofed custom-house store is one of the most conspicuous buildings, and there is also still remaining the ruins of an old Spanish fort, in which is situated the dwelling-house of the governor. This officer performs all the official duties of captain of the port, administrator, &c. The business of the port had increased considerably in consequence of the duties being lower than in Guatemala, but Libertad has of late years taken away much of its trade, being nearer the capital. Coffee is the chief article of export.

Vessels leaving Europe in August, September, October, November, and December, are sure to arrive during the best season for disembarking on the coast. No vessel should arrive later than the middle of April, as after that date the rains set in, and a heavy sea rolls in upon the coast, which prevents the launches from venturing out.

The port consists of an open bay, of which Point Remedios is the eastern boundary. There is anchorage all over it at a prudent distance from the shore in from 7 to 15 fathoms water; the bottom appears to be of sand, with here and there a patch of mud. Large vessels should not anchor in less than 12 fathoms.

The surf breaks heavily on the beach, which renders landing in ships' boats almost impracticable. The usual mode of effecting this object was in large canoes or bongoes, which are kept for the purpose of discharging cargoes. There is generally one of these kept afloat, moored just without the surf in the N.E. corner of the bay, near where the village is situated: persons desirous of landing usually pull in in their own boats, transfer themselves, with a portion of their crew, into the bongo, and haul in through the surf to the beach by a line fast to the shore for that purpose. To get on shore dry, they will then require to be carried out through the receding surf, which is about 1 foot or 18 inches deep. This contrivance, called the *anda-rivel*, is described more fully on page 76.

Formerly this mode of landing and embarking was the only one practicable, but the increasing commerce of the place, and the fact of a steep flat rock projecting from the shore about 70 ft. at three-quarters of a mile from the original landing place, and being deep water close up to this rock, suggested to Dr. Drivon, a rich proprietor, the formation of a pier.

The rock had long been called *El Muelle*. The pier was completed in 1854, and consists of a substantial timber construction leading on to this rock, and has a crane by which the ships' cargo is discharged or embarked. The pier is covered by a shed, with a white roof, conspicuous from sea. In front of the rock is a channel of 11 or 12 fathoms depth, and it is said that no sea is sent into it sufficiently heavy to affect a vessel made fast to the four moorings placed there for the purpose. This immunity from danger may be doubted in some

degree, but its safety is well understood by the local pilots. Water is conducted to the pier-head, so that it may be taken on board by a hose. At 50 yards from each side of the mole a buoy is moored.

Light.—On the end of the mole is a *fixed* light, visible 7 miles, showing red to southward, and green to northward, with a *bright* sector between over the best anchorage ground. To clear the dangers off Remedios Point, do not bring the light to bear northward of N.E. by N. $\frac{1}{2}$ N.

Beef, poultry, vegetables, and fruit, are plentiful and cheap. By giving two days' notice, fresh provisions may be obtained in large quantities from Sonsonate. Water is plentiful on shore, but the difficulty of getting it off through the surf is very great.

The mark for anchoring was, in 1852, the flagstaff on with the large door of the custom-house store, in 7 to 14 fathoms, according to the season. The flagstaff should not be brought North of N. 61° E., particularly when near the land, as the bottom will then be rocky, and there is the chance of breaking or losing the anchor. The bottom is not good holding ground, and vessels sometimes drive. In the fine season the current generally runs to the E.S.E. at the rate of eight-tenths of a mile per hour. It is high water, on full and change, at 2^h 35^m; greatest range 11 ft.

H.M.S. *Havana* anchored here in May, 1859, in 12 fathoms, with the landing place N. 55° E., and Point Remedios N. 81° 25' E., the shoal off the latter sheltering her from the S.E.

Capt. Harvey says:—Here we found a substantially built wharf, at which there is generally fair landing, although at times the surf is such as to prevent any approach. Merchant vessels discharge and receive cargo by their own boats. Beef, stock, vegetables, and fruits may be obtained in any quantity from Sonsonate; but two days' notice must be given to secure having any considerable amount. The pier, happily, is provided with cranes, which were useful in getting off bullocks. A vessel should stand no nearer to the Remedios Bank than to 20 fathoms without a good breeze and clear weather. The volcano Isalco was burning the whole of the stay. No lighthouse gives a better light; the bearing N.E. by N. is a good mark for the port.

The following observations on this port, and on approaching it, are by Capt. Worth, of H.M.S. *Culypso*, in 1847:—

Acajutla, or Sonsonate Roads, although not much known, is safe, the oldest inhabitant remembering only one wreck: the reef off Remedios Point breaks, the sea setting directly into the anchorage. Here the salt water is very injurious to the cables and copper; although at anchor not more than a fortnight, the cable and anchor were completely covered with small shell-fish, as also the boom boats; this remark is applicable to all the ports we visited on this coast, though not so much as at this place.

The passages to the westward are uncertain as to time, the land and sea breezes being so very unsettled.

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PORT ACAJUTLA.

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The land breeze always blows (if ever interrupted, only for a short period) at all the ports we visited, except Conchagua, and is nearly always sufficient to take a ship to sea. As a rule, I should recommend, on leaving any port, that you stand off shore, always bearing in mind that the sea breeze is from South to S.W. There is a current always setting to the S.E.

Between Conchagua and Acajutla the passage is very tedious, being never less than two days, and sometimes five, and even longer, the land breeze being not to be depended on, and the sea breeze often very light, although at times the sea breeze will blow very fresh indeed. The best plan, after leaving Conchagua, is to stand rather off shore, so as to make a long leg off with the sea breeze.

The coast is quite clear, there being anchorage nearly all along it.

We found the sea breeze seldom set in before noon, and often later, and a continual set to the S.E. The leading mark for Acajutla is the Isalco volcano, which smokes, and frequently sends up large jets of fire. On a N.E. by N. bearing it leads to the anchorage off Acajutla. Point Remedios, long, low, and thickly wooded, may easily be recognised.

This anchorage is difficult for a stranger to find; the best plan is to take notice of the several volcanos on the coast, after leaving Conchagua, viz., San Miguel, San Vincent, and San Salvador. The land is a low beach, the soundings decreasing gradually to 10 fathoms, at 3 or 4 miles off shore, until the volcanos are past, when it becomes tolerably high, and has 25 fathoms at a little distance from the beach, particularly in the bight to the S.E. of Point Remedios, where in that depth the surf can be heard quite distinctly. Point Remedios, which runs out from this moderately high land, is low, and thickly wooded, appears to stretch a long way into the sea, and has several black rocks, one nearly a solid square, lying just off it; these rocks are the inside part of a reef extending 3 miles in a S.W. direction, on which the sea breaks heavily at times. On the S.E. side of this point the beach is clear, having no rocks upon it; but on the N.E. side it is broken by rocks and clumps of trees, dividing it into a number of small sandy bays. Should you not be close in, you cannot make the point out, as it appears part of the low, thickly-wooded land that stretches from the before-mentioned moderately high coast to the westward of Istapa.

The volcano of Isalco, nearly 5,000 ft. high, is decidedly the surest mark, bearing N.E. by N., if it can be made out; but, as it does not smoke constantly, and is situated on the side of, and is lower than, the mountains behind (Sierra Madre), it is very difficult to find.

The Madre, and mountains to the westward of Isalco, are very high; it may be known by the table-land top, in which it differs from the others, they being conical, or approaching that form. The Isalco is a conical volcano, apparently

North Pacific.

on the East side of the Madre, and the crater is about one-fourth down from the table land.

Capt. W. H. Parker says that in the dry season there are so many fires on the mountains that Isalco cannot always be distinguished. In making the port from the southward, the custom-house is visible from a distance of 12 miles, with a good glass, and in coming from the eastward, the white shed on the pier will open out as Remedios Point is rounded, which point should not be approached within 4 miles. When the old custom-house is clear of the bluff, which leads clear of some rocky patches, and the wharf bears about E.N.E., run directly for the latter, and anchor in about 10 fathoms, three-quarters of a mile from the wharf.*

The coast between Acajutla and San José or Istapa, a distance of about 60 miles, runs W. by N. and E. by S., with scarcely any inflexion; it is throughout of gray sand, wooded to the shore, and beaten by a continual surf. Here and there the vegetation was of a paler green, and the whitened stems of the mangroves indicate the impassable entrances of the *Rios dos Esclavos*,† *Pazas* (the state boundary), *Santiago*, and *Caoba*. There is no known danger off shore, and the depths are regular, of sandy mud. The current runs from West to East, at half a mile to 1 mile per hour.

The best course to pursue in coming from Acajutla to Istapa, or rather San José, is to keep 2 or 3 miles off the land, in 16 or 25 fathoms, so as to take advantage of the land breezes, which are generally light. The sea breeze often sets in from S.W. to W.S.W., and then you can beat inshore into 12 fathoms. The lead is an excellent guide, and there is nothing to fear, as the depths diminish regularly. But when the sea breeze sinks about 6 p.m., and the land breeze will not give you a way of 3 knots, it is better to anchor at once, or you may lose ground.

* "Remarks on the Navigation of the Coasts between San Francisco and Panama," by Capt. W. H. Parker, P. M. S.S. Company, 1871.

† "The *Rio de los Esclavos*, which falls into the sea West of Acajutla, is described by Stephens as a wild majestic river. He crossed the bridge over it, erected under the Spanish dominion, and the greatest structure of that period. The village beyond was a mere collection of huts, standing in a magnificent situation near the river, and above which mountains rise covered to their summits with pines. Every predatory or fighting expedition between Guatemala and San Salvador passed through this miserable village. Twice within his route, Morazan's army was so straitened for provisions, and pressed by fear of pursuit, that huts were torn down for firewood, and bullocks slain and eaten half raw in the street, without bread or tortillas. After leaving this village, the country was covered with lava."

—*Incidents of Travel.*

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5. GUATEMALA.

The Republic of Guatemala is the principal state of Central America, in respect of population and wealth. According to the census of October, 1880, the population numbered 1,224,602; in 1881 it was estimated to have increased to 1,252,497.* It is generally mountainous, but a large part of the interior consists of elevated lands of unsurpassed beauty of scenery, of vast fertility, and unquestionable salubrity. Its great deficiency is the want of ports on either ocean, and this fact will act as a great check on its commercial progress. On the Pacific it extends from the River Pazas to the confines of Mexico, the River Tilapa being the boundary. This last boundary had been the subject of long dispute, but it was settled in 1854 by Guatemala ceding all right to the rich district of Soconusco, extending for nearly 100 miles along the Pacific, on the payment by Mexico of a considerable sum. The rivers falling into the Pacific are few and small; the largest is the *Michitoyat*, which passes the capital, but none of them can ever be of use to navigation.

The famous volcanos which are such a distinguishing feature of this great isthmus are here seen in their greatest majesty, and the Volcans de Agua, 13,517 feet, Fuego, 13,975 feet (near Old Guatemala), and Atitlan, 11,500 ft., have been very frequently described. The present capital is Nueva Guatemala, the third city of its name, and was founded in 1776; it stands at an elevation of 4,400 ft., in a vast and beautiful plain inland of its port, San José. At the census in 1880 its population was estimated to amount to 57,928. Coffee, cochineal, cotton, and indigo, are the chief products for export, but the first is the great staple of the country. Like its neighbour, the commerce of the republic is largely indebted to the various fairs which are held in different parts and in different seasons. In 1882 the value of the exports amounted to £714,562, and the imports £384,781. The principal towns are now connected by telegraph.

ISTAPA, or Istapam, at the mouth of the River Michatoyat (or Michitoya), is the outlet of the Lake of Amatitlan, and is said to be navigable from the Falls of San Pedro Martyr, 70 miles from its mouth. It was from the first the port of Guatemala, but it was closed on January 1st, 1853, when the port of San José, 8 miles to the westward, was declared to be the new port. This change was nautically unimportant, for both places were alike—wild open roadsteads, without a single attribute to give it the name of port. The village now consists of a few grass huts.

Istapa is an open roadstead, without bay, headland, rock, or reef, or any

* Censo General de la Republica de Guatemala, levantado el ano de 1880; published at Guatemala. Much information concerning the twenty-two departments of the republic will be found in this work.

mark whatever to distinguish it from the adjacent shores. "There is no light at night, and vessels at sea take their bearings from the great volcanos of the Antigua, more than 60 miles inland. A buoy was anchored outside of the breakers, with a cable attached, and under the sheds were three large launches for embarking and disembarking the cargoes of the few vessels which resort to this place. Behind the sand-bar were a few Indian huts, and Indians nearly naked. Generally the sea is, as its name imports, pacific, and the waves roll calmly to the shore; but in the smoothest times there is a breaker, and to pass this, as a part of the fixtures of the port, an anchor is dropped outside with a buoy attached, and a long cable passing from the buoy is secured on the shore.* It was from this place that Alvarado fitted out his armament, and embarked with his followers to dispute with Pizarro the riches of Peru."—*Stephens*.

The usual anchorage was with the flagstaff bearing between N. by E. and N. $\frac{1}{2}$ E., at half a mile off shore, in 14 to 16 fathoms. It is best to anchor to the East of these bearings, as there the boats in landing have the advantage of the current which runs to the eastward at from three-quarters of a mile to $\frac{1}{4}$ mile per hour.

Mountains.—The following remarks are by Mr. H. Thompson, master of H.M.S. *Talbot*:—"The whole of this country is remarkable for its mountainous ranges, which may be seen in clear weather from a great distance seaward, many of their lofty peaks and volcanos serving admirably as beacons to guide strangers to the various little ports and roadsteads situated on its coast, which otherwise would not be easily found. Such is the case when bound to the

* The discharge and loading of vessels lying off Istapa, and other places on this coast, which is not effected in the easiest manner through such a tremendous surf lashing the shore, is done by means of what is called here the "*anda-rivel*," Anglicè, "guess-warp," above alluded to.

This contrivance consists of a cable made fast to a strong post on the shore, the outer end of which is secured by an anchor some distance outside the surf. Within this anchor, which is marked by a buoy, but still sufficiently clear of the broken water, is another buoy attached to the warp, by means of which the strong launch employed is seized to it, or casts it off. The launch having been brought to the warp buoy, the warp is thrown into rowlocks, one on the bow, the other on the stern of the launch. These are then bolted in with a pin to prevent their slipping off, and secured by a stopper, wormed round it near the bolts. The *boyas*, or watermen, watch the heaves of the sea, which, singularly enough, are always heaviest in threes, and when the heaviest wave approaches, the pilot gives the signal, the lashings which secure the bow and stern are slipped, and at the same moment all hands haul in the warp; while running on the tremendous wave she is propelled with immense rapidity, and is usually driven on to the beach with the succeeding wave, when generally forty or fifty Indians, with the fall of an "*aparejo*," or treble-purchase line, which is hooked to a ring on the launch's stern-post, and secured to the post, haul her high and dry with the next wave. It sometimes happens that the *practico*, or bowman, does not take the right sea, and then a larger breaker over her, swamping the launch, or damaging the cargo, or perhaps losing it.—*G. U. Skinner, Esq.*

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roadstead off the village of Istapa. There are visible from the vicinity of this roadstead, to many miles seaward, four conspicuous mountains, which are situated as follows: commencing with the easternmost one, which is the volcano of Pacayo; next West of this is the water volcano (Volcan de Agua) of Guatemala; then the fire volcano (Volcan de Fuego) of Guatemala; and the last and westernmost is the volcano of Tajumulco. The first and last of these volcanos are of a moderate height, and flattened or scooped out at the top; but the two middle ones, which are the volcanos of Guatemala, are considerably higher, and much more peaked at their tops. The easternmost one of the two last-mentioned is the water volcano; it has but one peak, which, at some periods of the year, is slightly snow-capped, and from the holes and crevices near its summit ice is procured the whole year round for the luxurious inhabitants of Guatemala. The fire volcano is to the westward of the last-mentioned, and appears to have two peaked summits, which open and close according to their bearing. From the roadstead it has the appearance of one mountain with a deep notch in its summit. The upper part of this mountain has a whitish appearance, which might be mistaken for snow; but I am informed that it is caused by the action of fire. Smoke is constantly emitted from it, and may be seen from the sea in clear weather. From the anchorage at Istapa the true bearings of these four mountains are as follow: viz., volcano of Pacayo, N. 22° E.; water volcano of Guatemala, N. 5° E.; fire volcano of Guatemala, N. 8° W.; and the volcano of Tajumulco, N. 28° W. The thatched roof of a large hut, in the village of Istapa, which was just visible over the high white beach, then bore N. 17° E., distant about 2½ miles, and the depth of water was about 17½ fathoms. The above bearings of either of the volcanos of Guatemala nearly on will guide a vessel to within a few miles of the anchorage, and sufficiently near to make out the thatched roof of the above-mentioned hut, which is the only object that marks the spot, the remaining small huts, which constitute the village, being hidden behind the beach. There is also a small flagstaff close to the largest hut; but, unless the flag be flying, it is difficult to distinguish it, in consequence of its being mixed up with the trunks of trees that stand behind it. The entrance to the river is choked up by the sea-beach, through which it has not strength enough to force itself. The village of Istapa consisted of about fifteen huts, which afford shelter to about 40 or 50 inhabitants, who occasionally find employment in discharging merchandise from the very few vessels that call here.

In the bad season (July to September) I should imagine this a very unsafe place to anchor at, owing to its being entirely exposed to the ocean swell, which, with the southerly winds, is exceedingly heavy. Landing is only practicable in the finest weather.

SAN JOSE' DE GUATEMALA, the port of Guatemala, was established January 1, 1853, at a place previously called *Zapote*. There is not the slightest shelter, always a very heavy swell, and rollers occasionally.

THE COAST OF GUATEMALA.

The coast is very clear, running East and West, and the anchorage is about three-quarters of a mile from shore, in 11 to 15 fathoms of water. The swell breaks heavily upon the shore, and out as far as 40 or 50 fathoms from the beach, making it necessary to use the girt line (anda-rivel) for landing on and leaving the beach. The currents are very strong, and vary with each change of the moon, the variations sometimes taking place within the short period of six hours. From November to February the landing is easy. In March the ebb and flow of the tide extends from 90 to 100 yards over the shore, and at the flood tide the surf is so heavy as to dash up the beach a distance of 100 to 120 yards. After March the sea is again calm till July, and from July to December it is again rough, and the landing difficult.

An *iron screw-piled pier* has been constructed by the government, extending about 330 yards from the shore to a point beyond the breakers, thus enabling the transportation between ship and shore to be performed at every season of the year with facility and safety. There is a crane on the pier capable of lifting a weight of 4 tons.

A *fixed bright light*, visible 7 to 10 miles, is sometimes shown on the top of the custom-house. The best anchorage is shown by the light becoming hidden by the shed on the pier.

The town of San José had a population of 1,641 in 1880. Supplies for vessels are, however, dear, and procured with much difficulty here, unless provision be previously made to obtain them from *Escuintla*, a town 40 miles distant, on the road to the capital, with a population amounting to 11,398 in 1880. There are no means of refitting or repairing vessels at present. The exports consist of coffee, hides, sugar, &c.

The usual modes of conveyance to the interior are by mules and stages, and are sufficient. Diligences await the arrival of the steamers, for conveying passengers to the capital, 90 miles distant, and the roads in the dry season are excellent. In the wet season the roads are bad as far as Escuintla, but a railway was opened to this place from San José in June, 1880, passing through the principal sugar-producing district. There is telegraphic communication with the chief towns of the state, and the mail steamers call here fortnightly.

Capt. T. Harvey, R.N., who came here in H.M.S. *Havana*, in May, 1859, says that the place is utterly undeserving the name of a port, although it is the only landing-place for goods for Guatemala. The anchorage affords no shelter whatever; the surf has its full force. The only way a landing could be effected was by means of a surf-boat, and even this was capsized four times during their stay. The town of San José consisted of some half-dozen grass huts and a flagstaff, which could not be distinguished beyond 5 miles from the shore. The current generally sets to the westward, and yet a continuation of westerly winds will alter it.

Capt. G. F. Emmons, U.S.S. *Ossipee*, who came here in 1868, says:—San José is becoming a port of some importance as the only landing-place for goods

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There is some in the neighbour marks, however, of Guatemala, ge the anchorage on N. by W. $\frac{1}{2}$ W.; La Agua being th a deep notch in it the best guide till

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Capt. F. Wortmann, ing this coast the Fueg a distance of 80 miles season (December to Ma by winds from East, & N.W.—*Hydrographisch*. The position of this an to be in lat. $13^{\circ} 55' N.$, l Of the coast of Guatem account. At the tin port, and the ocean swell shipped from a store-hou Guacalate, there being go

SAN JOSE' DE GUATEMALA.

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on the coast of Guatemala, with this exception, it has no claim to the name of a port, being merely an open roadstead. The few grass houses composing the town are built among the trees on a high dark sandy beach, a large white house which can be seen at a distance of 6 miles forms the only mark on the coast for the port. The anchorage is opposite this house in from 8 to 13 fathoms, sand, distant about 1 or 1½ mile from the land.

There is some difficulty in finding the anchorage of San José, the coast line in the neighbourhood being one unbroken line of beach and trees; the best marks, however, on coming from seaward, are the remarkable volcanic peaks of Guatemala, generally visible at dawn. Four of these peaks can be seen from the anchorage on the following bearings:—Tajumulco, N.W. ¾ N.; El Fuego, N. by W. ½ W.; La Agua, North; and Pacaya, N. by E. ½ E., El Fuego and La Agua being the nearest and most conspicuous; the former may be known by a deep notch in its summit, while the latter being brought to bear North, forms the best guide till the white house can be distinguished.

Capt. W. H. Parker says the anchorage ground is tolerable, generally mud and sand, in 9½ or 10 fathoms, about one-third or half a mile off the pier, and 100 yards outside a buoy, with the flagstaff on the custom-house in line with the pier end bearing about N. ¾ W. In the rainy season it may be better to anchor a little farther out; a south-easter brings in a heavy sea, and sometimes communication with the shore is impossible. At that season this whole coast is liable to very violent squalls of wind and rain, called *Chubascos*, attended with heavy thunder and vivid lightning. No reliance can be placed on the currents. "When approaching the coast for the Gulf of Tehuantepec, you will frequently be set in towards the shore, and you must be on the look-out for this, particularly in dark nights. Keep the lead going. I have been set to the eastward a knot or more an hour from the Gulf to San José. When making this anchorage from the S.E., the only safe way is to be sure and make the land to the eastward of the port. The bearing of Agua volcano is of great assistance to you here, if it can be taken."

Capt. F. Wortmann, of the Hamburg ship *Magellan*, says that in approaching this coast the Fuego and Agua mountains are noticeable, being visible at a distance of 80 miles. The sea and land breezes are regular in the fine season (December to May), but in the wet season they are sometimes interrupted by winds from East, South, or S.W. The current principally runs to the N.W.—*Hydrographische Mittheilungen*, 1: 73.

The position of this anchorage has been determined from several authorities to be in lat. 13° 55' N., long. 90° 49' W.

Of the coast of Guatemala to the W.N.W. of San José we have no particular account. At the time of Malaspina's survey there did not appear to be any port, and the ocean swell must set on it with more than ordinary force. Sugar is shipped from a store-house at *San Geronimo*, at the mouth of the River Guacalete, there being good anchorage with Agua volcano bearing N. 25° E.,

in 5 to 7 fathoms. Being quite an open road, Capt. Wortmann, of the ship *Magellan*, says the cutters which bring off the sugar are sometimes unable to do so on account of strong adverse breezes, causing delay. About 8 miles more to the westward is *Tecoate*, where the anchorage is bad, over shifting sand. *San Luis*, about 35 miles farther to the N.W., at the mouth of the River Samala, may be known by two large sheds among some huts. The anchorage here is dangerous in the bad season, but the port is connected by road with the principal towns of the province.

Champerico, 12 miles N.W. of San Luis, has a custom-house, and is increasing in importance; in 1880 its population numbered 605. Coffee is loaded here in the fine season (November to April), but in the rainy season it is very unhealthy, and the place is almost deserted. It is connected with Retalhuleu, 25 miles inland, and Quezaltenango, the second largest town of the republic, and 50 miles inland, by a road. A fine pier has been built for facilitating the loading of vessels. Large quantities of salt are made here.

Champerico may be recognized from sea by some large white houses and flagstaffs. The anchorage, which is open and exposed, is in 6 to 8 fathoms, with Fuego volcano bearing N. 65° E., and Agua volcano N. 68° E. In the rainy season the anchorage is very bad, and the sea breaks furiously on the shore.

About 45 miles farther to the N.W. is the village of *San Benito*, whence india-rubber and hides are shipped.

The republic extends to the boundary of that of Mexico, the River Tilapa, a distance of 95 miles from San José. It forms the southern side of the province of Suchiltepeques, and is the eastern portion of the extensive bay called the Gulf of Tehuantepec.

The Province of *Suchiltepeques* is bounded on the West by the Mexican province *Chiapas*, and extends along the Pacific about 96 miles. It was much more populous formerly than in Juarros' time. The climate is warm, but less so than Chiapas. The province is watered by sixteen rivers; of these the Samala, which discharges itself into the sea, under the name of the Xicalapa, is the most important. It is fertile from its situation, and abundance of water; the chief article of commerce is cocoa, so excellent in quality as to be preferred by many to that of Soconusco.

All the coast from San José to the head of the Gulf of Tehuantepec is described as being low and sandy, containing many lagoons, with shallow entrances. Behind this low shore the mountains rise to a great height.

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Our geographical position is very unsatisfactory, and few ports were at which they might remedy the deficiency of the bay for any purposes of commerce; those ports; and it is ample notices to all for safety.

Mexico, as is well known, and change for many years, great ignorance of the basis of whose system of government.

When Nuñez de Balboa discovered the Pacific. The conquest of Mexico became a vice-royalty of the parent monarchy. The issue of the precious metals, the royal authority here, the royal insurrection broke out in 1513, one of the earliest of Mexico. Subsequently, in 1821, Iturbide was made Emperor of the North Pacific.

CHAPTER II.

THE WEST COAST OF MEXICO, BETWEEN TEHUANTEPEC
AND MAZATLAN.

THE coast described in the present chapter may be said to be that of the South extreme of the North American continent, and is the southern sea-board of the states of Chiapas, Oaxaca, Guerrero, Michoacan, Colima, Jalisco, and part of Sinaloa, portions of the Mexican republic.

Our geographical knowledge of the republic, generally, is very incomplete and unsatisfactory. On the Pacific shores, if the commercial importance of its few ports were at all commensurate with the natural riches of the districts of which they might be the outlets, navigators would be much embarrassed by the deficiency of our charts and descriptions. But as few points are visited for any purposes of trade, we have tolerably accurate and recent descriptions of those ports; and in the ensuing pages it is hoped that there will be found ample notices to allow the ship-master to approach them with confidence and safety.

Mexico, as is well known, has been the scene of constant intestine warfare and change for many years past; and to this evil must be added the very great ignorance of the great mass of the people—a startling fact in a *republic*, the basis of whose safety is the capacity of the people for an intellectual self-government.

When Nuñez de Balboa first landed on its shores (in the Mexican Gulf), Montezuma I. was emperor, and had extended the Aztec dominions to the Pacific. The conquest of his kingdom by Cortes is well known, and Mexico became a vice-royalty to Spain; and, with powers almost as absolute as that of the parent monarchy, Mexico was scarcely known to Europe, except by its issue of the precious metals. When Charles VI. of Spain abdicated in 1808, the royal authority here received a shock from which it never recovered; for an open insurrection broke out in 1810, and a national congress assembled in 1813, one of the earliest acts of which was a declaration of the independence of Mexico. Subsequently, the history is one of a sanguinary warfare, until, in 1821, Iturbide was made emperor, under the title of Augustine I. He

North Pacific.

soon abdicated and retired, but returning, he was apprehended and executed. The government was then modelled on a similar constitution to that of the United States; but the original party divisions remained, though under different names. The campaign which led to the annexation of Upper California to the United States in 1847 led to no internal amelioration, and the first hopes of the world were defeated, when the state was destroyed as an empire by the death of the heroic Maximilian. To these disturbances, and consequent insecurity of property, must be attributed the embarrassments of commercial enterprise, the enactments of the law, and the long train of evils which lie so heavy on this fine country, and its otherwise, in many respects, good population.

Mexico is divided into twenty-nine political divisions, and has an area of 741,820 square miles, the population, according to the census of 1882, being 10,001,884. About 2,800 miles of railway were open in 1883, and several important lines are under construction, some in connection with the United States system. Other lines are also projected to connect the numerous ports along the Pacific coast.

The country of Mexico, especially that part on the Pacific, is divided by the natives into *tierras calientes*, or hot regions; the *tierras templadas*, or temperate regions; and the *tierras frias*, or cold regions. The first includes those beneath the elevation of 2,000 ft.; the latter tract occupies the most important part of Mexico, and, in fact, is that vast plateau on which Mexico stands. On the low lands of the coasts the heat, during part of the year, is insupportable, even by the natives, and thus the town of San Blas becomes annually depopulated for a season.

The Cordillera or mountain chain, which, in the southern Andes, is a well-marked line of lofty ranges, and less distinctly so in the North and throughout Guatemala, in Mexico divides into two somewhat indistinct branches, following either coast. That to the South is irregular and in some parts but little known. At the head of the Gulf of Tehuantepec it is about 60 miles off the coast, on an average, but leaves many valleys of slight elevation between the detached portions of it. To the mariner most of them are unimportant, unless we mention the volcano of Colima, which becomes an excellent landmark for that portion of the coast. Most of the peaks are volcanic, some in activity; and the usual volcanic phenomena of eruptions and earthquakes are frequent, the latter particularly so; and many severe visitations of this sort are upon record. At Acapulco this becomes a serious bar to its continued prosperity.

Of our hydrographical knowledge of the Pacific coast a few words may be said. With some detached portions we are intimately acquainted, through the excellent surveys made in 1837-8, by Sir Edward Belcher, of the English navy, when on this coast in H.M.S. *Sulphur*. In the voyage of the French frigate *Venus*, commanded by Du Petit Thouars, who was on the coast at the same time with Sir Edward Belcher, we find some information; and to M. Tessier

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his hydrographical engineer, we owe some of the graphic information we possess. By Capt. (afterwards Rear-Admiral) Beechey, who was here in H.M.S. *Blossom*, the nautical world was informed of the exact nature of some of the islands and ports near the Gulf of California; but the surveys of the latter part of the coast by the officers of the U.S.S. *Narragansett*, 1873-5, has much increased our knowledge. Several of the ports and anchorages on the West coast of Mexico were also surveyed by the officers of the U.S.S. *Tuscarora*, in 1878-9.

For the remainder of the coast, the Spanish charts of the Madrid Hydrographic Office furnish the details. In 1790 the Spanish Government despatched an expedition, under Don Alessandro Malaspina, for the exploration of these shores, a task which we must suppose was completely performed; but the publication of his journal, which was looked for by the learned of Europe at that period, was frustrated by Malaspina, a little time after his return to Cadiz, being arrested by order of government, and thrown into the prison of Buen Retiro, and afterwards transferred to one of the strong castles of Coruna. In this captivity El Padro Gil, a man of great learning and merit, also shared, and all papers and drawings belonging to, or collected by, the expedition, were seized and suppressed by the government. Of the cause of this little is known. The disturbed state of Spain, in reference to her overgrown and ill-attached colonies, might have led to suspicions against Malaspina when in the country. Suffice it to say, that the charts, resulting from the survey, were subsequently published, as drawn up by Don Felipe Bauzá, F.R.S., from his observations while accompanying the expedition.

CLIMATE.—The following outline of the climate, weather, &c., by Commodore C. B. Hamilton, will be found useful.

The West Coast of Mexico is considered highly dangerous in the bad season, namely, from June to 5th of November, and all the vessels obliged to remain in the neighbourhood lie up either in the secure harbour of Guaymas or at Pichilique, in the bay of La Paz, both in the Gulf of California.

The hurricanes that occasionally visit this coast are so much dreaded, that in the months of July, August, September, and October, the ports are deserted, and trade ceases.

I believe the *Frolic* is the first vessel of any nation, whether man-of-war or merchant ship, that ever remained the whole bad season on the coast, and that of the two most dangerous ports, namely, San Blas and Mazatlan. I shall, therefore, give all the information I can relative to the bad season. The hurricane so much dreaded on this coast is called the Cordonazo de San Francisco, a name given by the Spaniards, on account of the hurricane preceding about the time of San Francisco's day, the 4th of October; the word Cordonazo signifying a heavy lash with a rope or whip; but, from my own experience, and all I can learn, these cordonazos may be expected any time from the middle of June to the 5th of November. The worst ones that have been

experienced of late years have occurred on the 1st of November, although the weather usually clears up about the 20th of October, and sometimes even sooner; and as soon as the weather does begin to clear up, a ship may, with common precautions, venture into the anchorages again, for this reason, the weather will give ample warning of a coming hurricane; whereas, in the previous four months, before the weather has cleared up, the circumstance that adds to the dangers of this coast is, that owing to the threatening appearance of the sky every evening, and the violent thunder storms and squalls at night, accompanied by heavy rain and lightning, the wind veering about, you are at first led to believe that the hurricane is coming every night, and latterly you see it is utterly hopeless to foresee the coming of it, as every night appearances were as bad as they could be; the barometer here being of little or no use, and a tremendous sea occasionally setting in. Thus the remaining off this coast during the hurricane season will cause great anxiety.

The squalls and gales usually commence about S.E., and quickly fly round to the southward and S.W.; you have generally time to get to sea when it commences at S.E.; but, as I have before shown, you must go to sea every night, if you can, if you would be free from the dangers of the cordonazos coming on. But a tremendous swell frequently sets in whilst the weather is in this threatening state, and the wind still light, which makes it impossible to get out. Moreover, if our boats happened to be out, and on shore when the swell came, it was impossible to hoist them in, and for this reason we have frequently been obliged to send our boats from the ship, with their crews, to be hauled up on shore, and remain there until the swell went down, that I might be ready to slip and go to sea.

It appears that the cordonazos come on an average once in 6 or 8 years, and we experienced none during our stay, although we had a gale on the night of the 21st of September. I was fortunately under weigh, and had plenty of room when it came on, having stood out to sea on the evening of the 19th, on account of the weather being bad, and fearing the full of the moon on the 20th.

It commenced about 9^h 20^m p.m. from the S.E., flying round to S.W., heavy rain, thunder, and lightning, with a very heavy sea, reducing us to close-reefed main-topsail, and fore-staysail, washing away a boat, and obliging us to batten down. The squalls come on very suddenly, the prevailing winds being in the bad season S.E. to South and S.W., and the heavy swell usually before and after the full and change of the moon. The swell is such as is seen in the Bay of Biscay in a heavy gale, and, unfortunately, usually sets into the bays before the wind comes.

I therefore think, that a ship caught at anchor off San Blas, or Mazatlan, by a cordonazo, would have small chance of escape, especially off the former, as she would either go on shore or go down at her anchors; to slip and stand out the instant it commences from S.E. is her best course.

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GULF OF TEHUANTEPEC.

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The range of the thermometer for June was 77° to 86° ; July, 80° to 87° ; August, 81° to 89° ; September, 83° to 92° ; October, 83° to 90° . The barometer appeared to be of little service, usually remaining 30 inches; seldom varying above a tenth, except during a heavy squall, when it rose considerably.

After the 4th of November the coasting and other vessels again make their appearance on the West coast of Mexico.

San Blas is very sickly during the bad season. Guaymas is healthy, although the thermometer stands there at the astonishing height of 106° in July, August, and September; and, owing to the extreme dryness of the atmosphere, ships receive much injury by the wood opening. Furniture, apparently well seasoned, there cracks and falls to pieces.

On this coast there are some immense fish, of the ray species. I caught two of them, and with difficulty hoisted one on board; it measured 19 ft. in breadth across the back, the mouth was 3 ft. 5 in. wide, and the flesh was 3 ft. 6 in. in depth in the centre. I had no means of ascertaining the weight, but found I could not lift it with the yard tackles and 60 men, it requiring 130 men with the heaviest purchases in the ship to hoist it in. These fish are common on the West coast of Mexico and Gulf of California, where they are more dreaded by the pearl divers than sharks or any other fish.

Of the eastern part of the Gulf of Tehuantepec we know very little more than is shown in the chart from Malaspina's survey. The country is all volcanic inland, and, from the proximity of the mountains to the sea, there is no stream of sufficient strength to penetrate across the beach.

The GULF of TEHUANTEPEC, an inexpressive term, is the name given to the slender bay which extends for about 180 miles westward from the frontier of Guatemala, and is derived from the town which stands a few miles inland at its head.

The American Isthmus is about 120 miles in breadth from the Gulf of Campeché on the Atlantic side, and has received much attention from its supposed fitness for an inter-oceanic canal, as the country seems to be a remarkable depression of the Mexican plain.

Surveys were made of the isthmus by General Don Juan de Orbegoso and Don Tadeo Ortiz in 1825, and Don José Garay and Signor Gaetano Moro in 1842-43, for the same purpose, of forming a communication between the Pacific and the Bay of Campeché, by means of a canal and the rivers falling into the lagoon of Tehuantepec, and the River Goazacoalcos, which runs into the Gulf of Campeché.

These surveys were not satisfactory, and it was accurately measured with the view of establishing a railway, by a scientific commission under General J. G. Barnard, U. S. Engineers, in 1850-1, by which its unfitness for a canal was demonstrated. However, another American expedition, with Capt. R. W. Shufeldt, at its head, made an examination of the isthmus in 1870-71, and

reported that it was practicable to construct a canal between the River Goatzacoalcos and Salina Cruz, a distance of 144 miles, but about 140 locks would be necessary.*

The latest scheme for making use of this isthmus is that by Capt. Eads, so well known in connection with the successful works for improving the entrance of the Mississippi River. He proposes to construct a railway, on which vessels of large size would be transported from ocean to ocean in a few hours. The highest point reached by the railway would be about 600 ft. above the sea level.

The whole shore of Tehuantepec is subject to the visitation of terrific hurricanes (which take their name from the isthmus), sweeping with resistless fury along this inhospitable coast, which does not afford a harbour of refuge even for the smallest class of sea-going vessels.

Since the end of the sixteenth century Tehuantepec has been but very little frequented; the sea retires daily from its shores, and the anchorage deteriorates every year. The sand brought by the Chimalapa increases the height and extent of the sandy bars lying at the exit of the channel from the first lagoon into the second, and from this into the sea.

Between the base of the Cordillera and the ocean is a plain which separates them from the lagoons, which, like an immense bay, communicates with the Pacific. This *llano*, or plain, consists of a shifting soil, formed by the detritus of the slate composing the adjacent hills.

From the Cordillera to the lagoons the plain occupies a space of about 18 miles. According to the United States Survey of 1871 the inner lagoon, named *Tilema* or *Superior*, is about 15 miles extent N.E. and S.W., by 10 miles in its greatest width, and from its mouth, called the *Barra de Santa Teresa*, to the point where the two discharge themselves into the ocean, called the *Boca Barra*, the distance is 5 miles. It is a marshy lake, the depth nowhere exceeding 21 ft., with several small islands in it. The outer or *Inferior* lagoon, including the eastern and western lagoons, is about 30 miles in extent, East and West, and it is stated that an arm of it reaches beyond the *Barra de Tenola* or *Tonala*, which lies in about long. $91^{\circ} 12' W.$ The mail steamers call at Tonalá. The town has a population of about 6,700.

There is but little depth in either of these lagoons; the outer one has not more than 16 ft. in the centre, in the line of the canoe navigation, the shallowest part having only 4 ft. The sandy tongue of land dividing the interior lagoon from the Tilema Marsh, and that dividing this from the ocean, is formed by the waters brought down by the rivers coming from the Sierra Madre, particularly the Chicapa and the Juchitan.

Soconusco.—In 1871 the Mexican Government declared this port, on the

* Reports of Explorations and Surveys to ascertain the practicability of a Ship-canal across the Isthmus of Tehuantepec, by Capt. R. W. Shufeldt, U.S.N., Washington, 1872.

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coast of Chiapas, open to foreign commerce, and proposed to construct a wharf for the use of the mail steamers which here ship cacao, coffee, &c. According to the chart, Soconusco bar is in lat. $15^{\circ} 25' N.$, but we have no particulars of the anchorage.

About 17 miles inland, in lat. $16^{\circ} 0' N.$, is Soconusco volcano, about 5,000 ft. high. Capt. W. H. Parker states that near *Tunala Bar* the shore should have a berth of at least 4 miles. To the westward of this bar there are numerous detached huts, and three villages, the first near San Francisco Bar. A remarkable hill, marked with white stripes of sand, lies 2 miles East of the latter bar, and at 5 miles westward of the bar is the village of Santa Maria del Mar, with a conspicuous church, 7 miles beyond which is the village of San Mateo.

Boca Barra, or *San Francisco Bar*, as above said, is the outlet of the extensive lakes which lie just within the line of sandy beach at the head of the Gulf of Tehuantepec, and is in about lat. $16^{\circ} 13' N.$, long. $94^{\circ} 46' W.$ According to Mr. Trastour's survey, the Boca Barra is 500 ft. wide, with a least depth of 7 to 10 ft., but the current sets out of it with great velocity. Mr. Trastour, on November 9th, 1850, at $11\frac{3}{4} h$, found it to run out at the rate of $7\frac{1}{2}$ miles an hour. The sea breaks a mile from the shore, making the entrance impracticable.

VENTOSA BAY, the harbour of Tehuantepec, is in lat. $16^{\circ} 11' N.$, and long. $95^{\circ} 8' W.$, about 22 miles westward of the Boca Barra, the narrow beach being low and sandy. The environs were carefully surveyed, under the direction of Major Barnard, in December, 1856 by Mr. P. E. Trastour, C.E., as a terminus for the Tehuantepec Railway, which was proposed to cross the isthmus from the upper course of the Gozacoalcos River at Minatitlan. This river falls into the Gulf of Mexico, and the railway was proposed to terminate on the Pacific to the north-eastward of the Morro, from which a pier was proposed to be run out for one-sixth of a mile into $6\frac{1}{2}$ fathoms. The coast from hence to Chipecua Point was surveyed by the officers of the U.S.S. *Tuscarora*, in 1879.

The S.W. limit of the bay is formed by the *Cerro Morro*, an isolated rock of an oblong shape, rounded at the summit, about 150 ft. high and 2,600 ft. in circumference; and a little more to the South by a pointed rock, separated from the former by an interval filled in with sand, and forming an angular projection into the sea called the *Morro* or *Ventosa Point*. This point is the eastern extremity of a line of rocky hills which forms the coast for a mile to the westward, and is the termination of a spur from the Cordillera of Oaxaca. There is a stone tower on the point, with a flagstaff near it.

To the northward of the Cerro Morro is the sandy beach, which trends first to the northward and then eastward, the seaward limits of an extensive plain, scarcely broken by the isolated hillocks of Huazoatlan. This beach is cut by sandy and shallow lagoons, having several outlets into the sea, and by the bed

of the Tehuantepec River. At the time of the periodical overflowing this current flows over a low country before reaching the ocean, which it does by its mouth, about three-quarters of a mile northward of the Morro.

It appears to have good holding ground, the depth being 6 to 9 fathoms, sandy clay bottom. The greatest difference in the level of the water observed was $6\frac{1}{2}$ ft. Ships ride sheltered under the Morro, the bay being open to South and East, allowing vessels to have ingress and egress, irrespective of the quarter from which the wind blows. The bay, however, is said to be shoaling.

The N.N.E. wind commences in the middle of October, and ceases early in April. It is at its height, and blows without interruption in November, but after this it is not so regular, and gradually ceases altogether.

If the summits of the mountains of Guichicovi and San Miguel Chimalapa, about 45 miles distant to the North and N.E., but visible from sea, are hidden by slate-coloured vapour at sundown, the northers will blow next day. If these mists are seen at the former hour on the southern horizon, the S.S.W. wind will blow on the following day.

Salina Cruz Bay lies to the westward of the hills extending from the Morro of La Ventosa. From the termination of that group of high lands the sandy beach of Salina Cruz trends westward for about $1\frac{1}{2}$ mile, and bending to the southward terminates at Salina Cruz Point, a rocky projection off which are several clusters of rocks, above and under water, to the extent of $1\frac{1}{2}$ cable, but the water is deep, 8 and 9 fathoms, just outside of them. In the bay the depth increases from 4 fathoms near the shore to 8 and 10 fathoms at 3 cables from the sandy beach. At a quarter of a mile North of the point, at the foot of the high ground, is a spring. The village lies in the N.W. part of the bay, and is connected with Tehuantepec by a road, and the mail steamers make it a port of call. The anchorage is good and well sheltered, and it is proposed to construct a mole, to extend 3 or 4 cables eastward of Salina Cruz Point. The telegraph cable connecting Mexico with Panama is landed here.

Salina del Marques lies to the westward of Salina Cruz, and is similarly formed, about 2 miles in extent, with lagoons at the back of the strand. *Conejo Bay*, to the westward, is divided from Salina Marques Bay by the *Morro de Salina Marques*, a hill 297 ft. high on a projecting point. *Conejo Bay* is $2\frac{1}{2}$ miles wide, and from its eastern point the coast trends 1 mile S.W. by W. to *Punta de Guela-giehi*, the eastern point of Chipegua Bay.

The town of TEHUANTEPEC is about 11 miles in direct distance northward on the beach of Ventosa and Salina Cruz Bays. It has a population of about 3,000, and has several churches and a modern college.

Chipegua Bay is $5\frac{1}{2}$ miles in breadth between Punta de Guela-giehi and Punta de Chipegua, and nearly half a mile N.E. of the latter point is a small rock, 10 to 15 ft. high, the depth between it and the northern part of the point being from $1\frac{1}{2}$ to 4 fathoms, and westward of it are heavy breakers. There is anchorage in 7 or 8 fathoms, at 7 cables N.W. by N. $\frac{1}{2}$ N. from the

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rock. According to the U.S. survey Punta de Chipegua is in lat. $16^{\circ} 1' 20''$ N., long. $95^{\circ} 22' 30''$ W. It has been proposed to make this the Pacific terminus of the railway across the isthmus of Tehuantepec.

The coast beyond this to the W.S.W. is very little known, but we have the following accounts of two landing-places between Salina Cruz and Guatulco, from the Nautical Magazine (1839), as related by Capt. Peter Masters.

The Bay of Bamba does not appear on the chart. The following description is by Capt. Masters:—*Punta de Zipegua* (Chipegua) is in lat. $16^{\circ} 1' N.$, long. $95^{\circ} 28' 30'' W.$ (?). From this point to the Morro de Ystapa (Ayuca) the coast runs about W.N.W. by compass. Between these points are several bluff headlands, which do not project far out from the general line of coast, and afford no shelter. Punta de Zipegua forms the eastern part of what is called the Bay of Bamba, and is a very remarkable headland. From the westward it shows itself with a bold dark cliff to the sea, about 400 ft. high, projecting out from the western line of coast nearly a mile, and forming a kind of double head. A short distance within the outer bluff is a peaked hill, quite bare of vegetation, with the appearance of a light-coloured sandstone. Further inland, between 1 and 2 miles, the ground rises higher in small hummocks, a few of which are quite bare, and others have a small quantity of stunted trees and bushes scattered over them. The head which forms the West side of the Bay of Bamba is not so high, nor does it rise so suddenly from the sea as Punta de Zipegua. It is also covered with bushes. The eastern side of Punta de Zipegua is covered with bushes and stunted trees; the sand only showing through the soil in very few places. When abreast of it, and off shore from 2 to 8 miles, the current was running to windward, W.S.W., from $2\frac{1}{2}$ to 3 miles per hour. About N.E., by compass, from the Punta de Zipegua, and distant from 4 to 5 miles (?), is a high reef of rocks, called *Piedra de Zipegua*, or *Machaguista*, in the chart, Island of Eschevan. Its greatest elevation is from 60 to 70 ft.; its length is about a third of a mile, running in an E.N.E. and W.S.W. direction. It is said there are no dangers near it but what can be seen. Between it and the main, from which it is about 4 miles (?) distant, in a N.W. direction, there is good anchorage; the best is close to the reef. The pearl oysters are plentiful near this reef, and are caught by the divers in the rainy season. The general line of coast from Punta de Zipegua toward Tehuantepec runs about N.E. by N., easterly.

The beach, or *Playa de Bamba*, is about 5 miles long, and must be very bad to land on with a fresh sea-breeze. There was more surf on it when we landed than was very agreeable. The boat was half filled, although the wind was blowing along the coast. We came to anchor abreast the western part of the beach, in 9 fathoms, sandy bottom, off shore $1\frac{1}{2}$ mile.

The Morro Ayuca, *Ayuta*, or *de Santiago de Ystapa* according to Masters, by the U.S. survey of 1879 is in lat. $15^{\circ} 52' N.$, long. $95^{\circ} 46' 44'' W.$ It is a

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bold cliffy point, surrounded by a reef, which has 3 and 4 fathoms close to it, and extending on the northern side about $1\frac{1}{2}$ cable's length, some of the rocks being always visible. The bay, about $1\frac{1}{2}$ mile in extent, has a low sandy shore, and vessels may anchor in 6 or 7 fathoms, fine sand, at three-quarters of a mile off, but only with northerly winds.

Near the Morro is the entrance of the small river of Ayuta, the stream that runs by Haumilulu and Ystapa. There is a bar across its entrance. The canoes land on the beach in preference to going over it, as this is attended with danger.

A few miles to the westward is the *Morro de la Laguna*, near which is a large lake, from which the headland takes its name.

Bay of Rosario.—The following description, and directions for this bay, are by Capt. Masters:—

The West side of the Bay of Rosario is formed by the Morro de las Salinas de Rosario, and is in lat. $15^{\circ} 50' 25''$ N., long. $96^{\circ} 2' W.$ (?), by four sets of lunars taken East and West of the moon. It projects about a mile beyond the line of coast. On the western side is a beach 4 or 5 miles in length to the next head. When abreast of Morro de las Salinas it appears like an island with two large rocks abreast of its eastern and western part, but the whole is connected to the main; what appears to be the eastern rock being a broken rocky head, about 160 ft. high. The western one is about half the elevation. Both these heads terminate with a broken cliff; the tops of them are bare, and of greyish colour; the lower part is quite black, caused by the sea washing against them. Between these heads is a small sandy bay, at the foot of the Morro, which rises gradually from the beach to the top of the hill, and is about 180 to 200 ft. high. It has a few straggling bushes on it, but its general appearance is very barren. The beach of Rosario is 10 miles long from Morro de las Salinas to Morro de la Laguna Grande, which is its eastern extremity. About half the distance between the Morros is a rock on the beach, about 40 ft. high, and nearly the same diameter; at spring tides the water flows round it.

During the time of our lying in the Bay of Rosario, which was from the 12th of February to the 1st of April, we had three smart northers. These came on at the full and change of the moon. At this time the surf runs very heavy on the beach; our boat was capsized several times whilst we lay here, in landing and coming off. At times the sea broke very heavily in all parts of the bay, that is, on the beach. I was caught on shore, a few days after arriving here, during the first norther, which came on suddenly with a parching hot wind. A cross, confused sea hove in from the South and N.E. The wind must have blown strong out in the gulf, from the same direction, and though it blew very heavily for three days, with the wind at times to the westward of North, the sea kept up until some time after the norther had ceased blowing. This is not generally the case, for a strong norther (and in particular if it veers

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to N.N.W.) beats the sea down, at which time landing is attended with little or no risk, which was the case when we had the last two northers. I was informed (and judging from appearances I think correctly) that very often when the wind is North, or N.N.W., close in shore, it is N.E. in the offing, which makes it impossible to land on the coast. I remarked whilst lying here, at the full and change of the moon, when no norther was blowing, that although the surf ran so high that no boat could land, the vessel lay without any motion. We were moored less than 300 fathoms from the shore. The surf appeared not to be caused by a swell rolling in, and agitating the sea at the surface, but to rise from below, and without any apparent cause, as we had light winds and fine weather the most of the time we lay here. On another occasion I was caught on shore with a boat's crew for three days. In attempting to get off to the ship, the boat was capsized and stove. It was then, and had been for a week previous, nearly a calm. The heavy ground-swell invariably blew from the S.S.W. We fortunately escaped from this beach without losing any of our people, which was more than I expected, having had three laid up at different times, who were saved from being drowned by a mere chance.

In addition to what has already been said about this part of the coast, it can be known by the low land at the back of the beach of Rosario. This runs in from 1 to $2\frac{1}{2}$ leagues before there is much rise in it, and is thickly covered with trees. From North to N.W. of Morro de las Salinas, nearly 2 leagues from the shore, the rising ground is formed by a number of small barren hillocks. From our anchorage, where we loaded, the following bearings were taken, lying in $9\frac{1}{2}$ fathoms water, sandy bottom. There are two large patches of a whitish appearance, the farthest range of the Cordilleras; the eastern is the lowest, and bore N. $59\frac{1}{2}^{\circ}$ W. The appearance cannot be seen, unless from a little to the westward of Morro de las Salinas. This has every appearance of being a waterfall, and rises from the other patch in a N.W. direction at about an angle of 45° . It issues into a small valley in the Cerro del Chonga. The highest point of this range is but a small elevation above it, and is covered with trees. The waterfall declines towards the South, and can be seen descending for several hundred feet before it is lost sight of amidst the forest below. Cerro de Zadan bore N. 89° W., and the extreme bluff of Morro de las Salinas, S. 36° W., $3\frac{1}{2}$ miles. The eastern point well within the bearings, and Punta de la Laguna Grande, N. 71° E., 6 to 7 miles; the rock on the beach (already mentioned as 40 ft. high), N. 65° E.; and the galena or shed, under which the cargo was piled, N. 26° W., half a mile; bearings by compass.

At the western part of the bay are four palm trees close to the beach. The distance from the Morro de las Salinas is about half a mile, and between these trees and the Morro is a larger cluster of palms. Between these two clusters is at all times the best place to land, as a boat can beach here with compara-

tive safety, when at every other part of the bay the sea runs very heavy. At the neaps we found the place quite smooth, with the exception of a sea heaving in at about every 10 or 15 minutes; but it causes no risk to a boat provided she is kept end on.

At the south-western part of the beach, and where a small pathway leads to cross the Morro de Salinas, close to the sea-side, in the cliff of a rock, is a small spring of excellent water. We always found it clear and cool, even at noon; my consignee said we could fill the ship's stock of water from it with dispatch, but I soon found out that he knew nothing about it. The quantity that could be filled in a day did not exceed 30 gallons, and after having landed all our water-casks we had to re-ship them, through a great deal of surf, and land them at the galena abreast the ship. We filled our water at a well about a mile from the beach, but the supply was very limited; it being the only well that had water in it up to the day of our sailing, we did not complete our stock.

A captain of a ship should trust to no promises when he comes here, either with regard to supplies or anything else, no matter by whom made; and, as water and fuel are indispensable articles, the filling the one, and cutting the other, should be commenced immediately on their arrival by some of the crew. It is useless to employ Indians to work for the ship (that is, on shore), the greatest part of them will neither be led nor driven. On board they answer better (that is, a few of them) to haul the wood about in the hold. I found the promises of Indians, and, as they called themselves, "*gente decente y civilizado*," on a par.

From the Bay of Rosario to the Island of Tangolatangola there are several small headlands, which do not project much beyond the general line of coast, with the exception of Morro de las Salinas de Rosario. Most of them have a steep cliff facing the sea, with fine sandy beaches between them; at the back of which are scattered a few small trees and bushes, the land rising in very irregular-shaped hills toward the Cordilleras. Abreast of the beaches, between the heads, the anchorage is quite clear, and when in from 9 to 12 fathoms water the distance off shore is about a mile, with sandy bottom.

The *Island of Tangolatangola* is thus mentioned by Dampier:—"At the small high island of Tangola there is good anchorage. The island is indifferently well furnished with wood and water. The main against the island is pretty high champion savannah land, by the sea; but 2 or 3 leagues within the land it is higher, and very woody."

Capt. Masters describes it thus:—"The Island of Tangolatangola is E.N.E. 3 miles from Guatulco, and makes from the westward as a part of the main land; the outer part of it is quite bluff, or rather a cliff of a brownish stone, the strata of which are horizontal, and it has the same geological appearance as the land on the main nearest it to the N.E., and of the same height, namely, about 150 ft. Within the island, and round the western side, is the entrance

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of the Bay of Tangolatangola. At the bottom of the bay is a fine sandy beach; the anchorage is said to be very good in it, but not equal to Guatulco."

According to the survey by Commander Philip and the officers of the U.S.S. *Tuscarora*, 1879, Tangolatangola Island is separated from the coast by a channel a cable wide in its narrowest part, with a depth of $3\frac{1}{2}$ fathoms. Rocks extend to the N.W. of the island. The entrance to the bay is 6 cables wide between the island and the western point, there being anchorage in 10 fathoms about midway on this line. The bay thence extends for $6\frac{1}{2}$ cables to the N.W., continuing to be of the same width.

The *River Capulita*, both according to Dampier and Malaspina's chart, must fall into the sea hereabouts. Dampier says that it is rapid and deep near its mouth.

About 8 cables S.W. of the West point of Tangolatangola Bay is the East point of *Santa Cruz Bay*, limited to the West by Punta Rosas and the Piedra Blanca. There is a small islet or rock near the centre of the bay, and the depth varies from 11 to 15 fathoms, in the entrance, to 5 and 4 fathoms near the shore.

PORT GUATULCO† lies to the westward of Punta Rosas, and is a very secure harbour. The *Piedra Blanca* lies about 2 cables E.S.E. of Punta Rosas, the channel between being narrowed by some rocks extending off the point. The entrance to the port is about $3\frac{1}{2}$ cables wide, and it thence extends three-quarters of a mile to the N.W., being $1\frac{1}{2}$ cable across in its narrowest part. The depth gradually shoals from 12 fathoms in the entrance to 5 and 4 fathoms at its head. According to the U.S. survey, the observation spot on the beach at the head of the port is in lat. $15^{\circ} 44' 58''$ N., long $96^{\circ} 8' 12''$ W. It is high water, on full and change, at $1^h 30^m$, and the rise is about 6 ft.

Dampier's clear and graphic account of it is as follows:—"Guatulco is one of the best ports in all this kingdom of Mexico. Near a mile from the mouth of the harbour, on the East side, there is a little island close by the shore; and on the West side, half a mile from the mouth of the harbour, there is a great hollow rock, which, by the continual working of the sea in and out, makes a great noise, which may be heard a great way. Every surge that comes in forceth the water out of a little hole on its top, as out of a pipe, from whence it flies out just like the blowing of a whale; to which the Spaniards also liken it. They call this rock and spout 'the buffadore' (*bufadero*, Spanish, a roarer), upon what account I know not. Even in the calmest seasons the sea beats in them, making the water spout at the hole, so that this is always a good mark to find the harbour by.* (This is also described by Mr. Masters.)

† This description will also exactly apply to another of these singular phenomena, the *Souffleur* (French, blower), at the South point of the Mauritius. Here the water is driven up with enormous force to the height of 120 to 140 ft. above the waves, and may be heard

"The harbour runs in N.W., but the West side of the harbour is best to ride in for small ships, for there you may ride land-locked, whereas anywhere else you are open to the S.W. winds, which often blow here. There is good clean ground anywhere, and good gradual soundings from 16 to 6 fathoms; it is bounded by a smooth, sandy shore, very good to land at, and at the bottom of the harbour there is a fine brook of fresh water running into the sea. Here formerly stood a small Spanish town or village, which was taken by Sir Francis Drake; but now there is nothing remaining of it besides a little chapel standing among the trees, about 200 paces from the sea."*

The following remarks, by Capt. Masters, will complete the description:—*Santa Cruz*, Port of *Aguatulco* (*Guatulco*), is very difficult to make; it is situated in a small bay, at the bottom of which is a sandy beach; on its eastern part two huts are built, not visible unless close in-shore. The *Piedra Blanca* is a reef of rocks extending N.E. by E. and S.W. by W. about a quarter of a mile; the western part of the reef is nearly 40 ft. high, and for about one-third of its length it is of the same elevation; but the remaining two-thirds to the eastward is low, in places level with the water. When abreast of it and off shore a few miles, it appears to be a part of the coast. Although it is called *Piedra Blanca*, it is a dark irregular-shaped reef of rocks.

The anchorage in *Guatulco* is said to be good. It is well sheltered from all winds, except between East and S.E. by S.; but, as the strongest winds blow from the northward, except in the rainy season, it may be considered a very safe port. It is the only place that can be considered a harbour to the eastward of *Acapulco*, and even in the rainy season I was informed that a vessel might lay there in perfect safety. The depth of water in the bay is from 7 to 9 fathoms, with a clear bottom.

When about 5 miles off the shore from the *Bufadero*, the western extreme point of land has a broken rocky appearance, and is not so high as the land adjoining. When about 2 leagues off shore from the *Bufadero*, another cape, farther to the westward, can be seen. Its extreme point is rather low, but rises gradually inland to a moderate elevation.

To the westward of *Santa Cruz* are two bluff heads, which, when abreast of them, might be taken for islands. The first is about 3 miles from the port, the other is 2 miles farther to the westward, and has a white sandy beach, from

a long distance. They are also seen, too, at times, around the bases of icebergs, and there was one, the *Devil's Trumpet*, on the coast of Cornwall. Other instances, less striking, might be adduced of these singularities, which are well worthy of a seaman's attention, showing, as they do, the power the waves exert, which, to raise such a column of water as above mentioned, must be from 3 to 5 tons per square foot.

* *Guatulco* seems to have been an unfortunate place during the buccaneering expeditions against the Spaniards, for Sir Francis Drake sacked the place in 1574, and it was burnt in 1587 by Sir Thomas Cavendish, among other places. The reader will find many notices of these and similar incidents in Admiral Burney's collection.

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which to the Bufadero the coast is rocky. The land which crowns this part of the coast is covered with stunted trees and brushwood. Between 4 and 5 leagues, N. $8\frac{1}{2}^{\circ}$ W. (by compass), is the *Cerro Zadan*, having a bell-shaped top, and a ridge on its N.E. side connecting it with the higher range of the Cordilleras. The *Cerro Zadan* is elevated above the sea rather more than 6,000 ft. The mountains a few leagues farther inland cannot be much short of 10,000 ft. high, as they can be seen over the *Cerro Zadan*.

The Port of Guatulco is so bad to make that vessels have been upwards of a fortnight in searching for it. It was by the greatest chance possible we had not passed it, although we were not $1\frac{1}{2}$ mile from the shore. The two huts which were on the beach can scarcely be distinguished from the trees near which they are built.

At about 6 miles West of Guatulco is a small green island called *Sacrificios*, about a quarter of a mile long, and $1\frac{1}{2}$ cable off the land. There is a small bay to the West of the island, but the island is surrounded and the coast lined with rocks. The best anchorage is between the island and the main, where the depth is about 5 or 6 fathoms, with the bluff at the head of the bay bearing North, sheltered from easterly winds. It is high water, on full and change, at 3^h 15^m; the tide runs strongly, rising and falling 5 or 6 ft.

At $2\frac{1}{2}$ cables S. by W. $\frac{1}{2}$ W. from the S.W. point of the island is a rock with 11 ft. over it at low tide, and about $1\frac{1}{2}$ cable S.E. by S. $\frac{1}{2}$ S. from the same point is another with 12 ft. over it. The port is difficult to recognize; if coming from the westward, *White Rock*, lying a mile off shore, about $16\frac{1}{2}$ miles westward of the port, is a good mark.

The land winds are here at North, and the sea breezes generally W.S.W., sometimes at S.W., with an easterly current.

Westward of *Sacrificios* the shore is all formed of sandy bays, the country tolerably high and wooded, with an enormous swell tumbling in on the shore.

PUERTO ANGEL, or Port Angeles, the port for the city of Oaxaca, was opened to the foreign and coasting trade on February 1st, 1868, and is 17 miles to the W. by S. of *Sacrificios* Island. The following is old Dampier's description of it:—"It is a broad, open bay, with two or three rocks on the West side. There is good anchorage all over the bay in 30, 20, or 12 fathoms water, but you must lie open to all winds, except the land winds, until you get into 12 or 13 fathoms; you will then be sheltered from the W.S.W., which are the common trade winds. The tide rises about 5 ft.; the flood setting to the N.E., and the ebb to the S.W. The landing in the bay is bad, behind a few rocks; the swell is always very great. The land bounding the harbour is tolerably high, the earth sandy and yellow, in some places red. It is partly wooded, partly savannahs."

"Eighteen miles westward of Port Angel is a small rocky island, half a mile off shore. The coast is all small hills and valleys, and a great sea falls upon the shore."

According to the U.S. survey of 1870, the entrance of Port Angeles is nearly 3 cables wide, and it thence extends about half a mile to the northward, its narrowest part being $1\frac{1}{2}$ cable across, between Bufaderos Bluff, 200 ft. high, and the island on the western shore. The depth in the entrance is 12 to 13 fathoms, shoaling to 6 and 5 fathoms at its head. The mail steamers call here.

The coast westward of Port Angeles, as far as Acapulco, is very little known; several rivers and lagoons empty themselves into the sea, as shown on the chart. Capt. Parker states that in long. $97^{\circ} 3'$ there is a high bluff with huts on it, and in $97^{\circ} 48'$ is the *Rio Verde*, in the neighbourhood of which the water is much discoloured in rainy weather. There are some huts a few miles to the eastward of the *Rio Verde*.

Near *Alcatras Rocks*, two white rocks in about long. $97^{\circ} 25' W.$, the land is moderately high and wooded; farther inland it is mountainous. A few huts lie to the westward of them. At 5 or 6 miles to the West of the Alcatras are seven or eight white cliffs by the sea, which are very remarkable, because there are none so white nor so close together on all the coast. It is said that a dangerous shoal lies S. by W. from these cliffs, 4 or 5 miles off at sea. Two leagues to the West of these cliffs there is a tolerably large river (or entrance to a lagoon), which forms a small island at its mouth. The eastern channel is shallow and sandy, but the western channel is deep enough for canoes to enter.

Maldonado Point.—The coast and shoals in the vicinity of this point were examined by the U.S. surveyors, in 1878, and the following information is taken from their report.

Escondido or *El Recodo*, the western extremity of Maldonado Point, is in lat. $16^{\circ} 18' 40'' N.$, long. $98^{\circ} 32' W.$ Close under the point is a small bight, where there is good landing, at a mile from which fresh water may be obtained in abundance. The coast for 6 miles westward of Maldonado Point consists of sandy cliffs, 200 to 300 ft. high, divided by ravines; for 2 miles to the eastward it is rocky, with the exception of two small sandy beaches. The country is thickly wooded, and *Cuacaul Peak*, about 2 miles S.E. of El Recodo, is 400 ft. high; the *Beehive*, 3 miles N.W. of the point, and about a mile inland, is of the same elevation. At the close of the dry season the land is frequently obscured by smoke, when vessels should not approach within the depth of 20 fathoms.

Tartar Shoals, on which H.M.S. *Tartar* struck, March 4th, 1863, lie about 2 miles S.W. of Maldonado Point. The most dangerous outer patches lie within a space of $1\frac{1}{2}$ mile N.W. by W. and S.E. by E., between a patch of 16 ft. and one of 18 ft., and near the central part of this space are two sunken rocks, with $7\frac{1}{2}$ ft. and $13\frac{1}{2}$ ft. over them respectively, lying about 2 miles S.W. $\frac{1}{2}$ S. from the extremity of Maldonado Point. Shoal water also extends

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1½ mile to the W. by N. of the point, and near the outer end is a patch of 2 to 3 fathoms, on the southern extremity of which is a wreck.

Passing vessels will avoid these shoals by not coming within the depth of 20 fathoms. The current sets in a south-easterly direction, varying between E. by S. and S.S.E., from a half to 2 knots per hour; strongest on the ebb, E.S.E. During the wet season the current is said to set W. by N.

Off Cuacaul Point, from 2 to 3 miles distant, there is anchorage in 8 or 10 fathoms, sheltered from the S.W. by the shoals.

The *River Dulce* lies about 12 miles N.W. of Maldonado Point; *Clio Rock* is stated to lie 3 miles off it, at 3 miles from shore, with 6 fathoms around it.

ACAPULCO.

This celebrated seaport has sadly fallen from the high position it once held among the places of commercial importance in the world. It owed all its prosperity to the system pursued by the Spanish colonial policy, and, when that power became annihilated in the new world, Acapulco descended, not to its level as a harbour, for it is one of the finest in the world, but to that of the capability of the surrounding country in supporting it. This, as is well known, is very limited, and the foreign trade that it has across the Pacific is of very minor importance. The population now amounts to about 3,000.

In addition to the changes in its external relations, it has some very serious drawbacks to any permanent prosperity. The climate is extremely hot, and pernicious to European constitutions. This is increased by the proximity of a marshy tract to the East of the town. During the dry season this marsh dries up, and occasions the death of great quantities of small fish, whose decay under a tropical sun causes no ordinary amount of pestilential vapours to be diffused, a fruitful source of the putrid bilious fevers so prevalent here and in the vicinity.

Being entirely surrounded with high mountains, the sun has intense power and the usual breezes are in a measure intercepted. To remedy this, an artificial cut was made through the chain of rocks which surrounded the town, and this has caused a freer circulation of air.

Earthquakes are a great scourge to Acapulco, and must prevent its ever becoming a substantial town; at present it is poor and mean. Besides the earthquakes, the heaviest of which occur between March and June, the rainy season is also another great drawback, and is felt here severely. It commences about the middle or end of July, and continues until the end of October. Owing to the immediate vicinity of a very lofty chain overlooking the town (one of 2,790 ft.), the fall is heavy and almost incessant. It has been asserted that, in 1837, the rain gauge frequently indicated 28 inches in 24 hours. During

North Pacific.

this period the inhabitants are compelled to use every precaution to keep their houses dry, particularly under foot; a neglect of this is supposed to produce fever. The heat during this period is excessively oppressive, especially in May, when the temperature seldom falls below 98°. Water then becomes scarce, and, towards the end of the dry season, the ponds run dry, and wells are their only resource.—*Sir E. Belcher.*

It has been well surveyed, and the plan from the united observations of Sir Edward Belcher and M. de Tesson, the Hydrographical Engineer to the expedition of Admiral Du Petit Thouars, in the *Venus*, with the later survey by the U.S. officers in 1879, will give a perfect idea of the port.

It consists principally of one extensive basin, in an angle of which, on the N.W. side, stands the town. At its head are some whitish rocks, the *Piedras Brancas*, named also San Lorenzo and Farallon del Obispo, useful as marks in entering. There are two entrances, formed by *Roqueta* or *Grifo Island*. That to the North of it is called the *Boca Chica*, or Little Entrance, and is narrow. The principal entrance is between the South point of Roqueta (*Siclatu Point*) and the S.E. point (*Bruja Point*) of the harbour, and is above $1\frac{1}{2}$ mile in width. It is quite clear.

The entrance into Acapulco lies about midway between the East and West extremes of a high portion of the coast, which stands forward in a very prominent way to the southward of the rest of the coast; the centre part is the highest, probably about 3,000 ft. above the sea.

Both ends run off to bluff points; the eastern one is called Point Bruja, and is distinguishable by its presenting a set of steep white cliffs; it is succeeded on the eastern side by a long line of white sandy beach, backed by a lower range of country, which reaches to the foot of the hills.

The entrance of the harbour, when bearing North, has Point Bruja on the East, and a small promontory on the West, not unlike each other, and both having white cliffs.

The entrance may also be distinguished by a remarkable white rock, the *Farallon del Obispo*, 148 ft. high, which lies nearly abreast of the middle part of the white beach at the bottom of the Bay of Acapulco; this may be seen with ease at the distance of 10 or 12 miles, when it bears on any point of the compass between N. $\frac{1}{2}$ W. and N.E. by N. $\frac{1}{2}$ N. by compass; in other cases it is shut in, either by the land near Port Marques, or by the Island of Roquetas, off the entrance.

Port Marques, an inlet $1\frac{1}{2}$ mile in depth, lies to the eastward of Point Bruja; its entrance between *Diamante Shoal* and the coast to the N.W. of it, is $7\frac{1}{2}$ cables wide. It is not easily made out till within 5 or 6 miles. In the entrance the depths are 18 to 20 fathoms, the shores quite bold-to, and in the inner basin from 10 to 15 fathoms, but near its head, within the depth of 5 fathoms, is a sunken rock.

Roqueta, or Grifo Island, is $1\frac{1}{2}$ mile West of Point Bruja, that being the

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width of the Boca Grande. A *fixed bright light*, visible 4 or 5 miles, is shown from a white wooden tower on the summit of this island, when the mail steamers are expected. About a cable off its N.E. end is a smaller island, 50 feet in height, called *El Morro*; and at nearly 3 cables East of this is a small rock, which is only 4 ft. above high water. This should be looked after if you enter either by the Boca Chica or the Great Entrance. *Point Grifo*, which is nearly a mile N. by E. from the Morro Rock, is the S.E. point of an inner bay, called *Santa Lucia Bay*, on the North side of which is the town of Acapulco. There are no dangers in Acapulco Harbour, except the *Sérieuse Shoal*, of about 3 fathoms, close to the North side of the harbour, half a mile E.N.E. from the Castle of San Diego, and nearer the shore than any ship would think of going.

Supplies are not easily obtained at Acapulco, with the exception of fruit and fowls. There is a coaling station here for the mail steamers. Vessels moor to the buoys about 100 yards from the shore, in 10 to 12 fathoms, or they can discharge alongside the wharf in deep water.

There can be no difficulty in making out the situation of this harbour, when it is understood that its latitude is $16^{\circ} 50' N.$, and that it is pointed out by a lofty promontory, which maintains its height and abruptness to the very sea, without any low land; this high land is covered with trees or shrubs, and everywhere presents a green surface, except where it meets the sea, and then its face is laid bare, and shows only naked white or gray cliffs of granite, not of a massy character, but splintered in all directions.

The anchorage is abreast of the town in the western corner of the bay, near two white rocks, to one of which a hawser may be made fast, and the ship canted to the sea breeze. There is a remarkable high land considerably to the eastward, and much farther inland than the promontory of Acapulco, having a long tabular top, which rises considerably above the neighbouring peaks. But there is no difficulty in distinguishing this promontory, when coming along shore from the eastward, as it is the first high coast land which reaches to the sea, and terminating a line of low white beach. On the western side the coast line is high, and offers such a variety of forms and heights, that it may not be easy to distinguish the high land of Acapulco, or rather a stranger might perhaps mistake some other part of the coast for it.

The paps of Coyuca are the marks generally pointed out as affording the means of distinguishing the land; they lie some leagues to the westward or W.N.W. of the promontory of Acapulco, and might be better described, I think, as a castle or fort-like mountain, than as paps. There is first a very abrupt precipice facing the West, with a surface somewhat tabular, but not quite level; the top being nearly equal, in horizontal length, to what the cliff is in abrupt height; then there is a nick or gully which is succeeded by a flat peak, not very unlike a pap. After this there is a long hog-backed ridge, with an irregular peaked termination at the eastern end. The land between this and

Acapulco sinks considerably, and though it still remains a tolerable height, the promontory is always sufficiently conspicuous.

When its extreme South point bears about East, and indeed when it bears considerably to the northward of East, there is no high land to be seen beyond it to the eastward.

At the distance of 7 or 8 leagues the land about Point Bruja makes like an island.—*Basil Hall*.

Sir Edward Belcher says (January 12, 1838):—We made the high paps of Coyuca, to the westward of Acapulco; but I cannot persuade myself that they are good landmarks for making the port. In the offing they may be useful if *not obscured*.

Acapulco may be approached from the southward or westward, by keeping the western cone open of the land, which will lead up to the Boca Chica entrance, or until Acapulco port is so close under the lee, that no further marks are necessary. There is no hidden danger in the entrance to Acapulco. Keep a moderate distance from either shore; 5 fathoms will be found alongside all the rocks, and 25 to 30 fathoms in mid-channel. Round Point Grifo sharp, rather than stand over to San Lorenzo, as the wind, generally westerly, heads on that shore. If working, tack when the rocks on the South point of Town Bay show in the gap.

The two best berths are off the rocks alluded to; that outside is preferable; but in either case let the outer rock bear W.S.W. or W.N.W., so that a hawser fast to the rock may keep your broadside to land or sea breezes, and prevent a foul anchor.

The Harbour of Acapulco has long been reckoned, for its size, one of the most complete in the world. It affords sheltered, landlocked anchorage of 16 fathoms and under, in a surface of 1 mile square; which, allowing for moorings, would, at half a cable's range, or 1 cable asunder, accommodate 100 sail of vessels, even of the line. The bottom is sandy at its surface, but clayey beneath, and holds well.

It would naturally be inferred that, surrounded on its North and East sides by mountains ranging from 2,000 to 2,700 ft., and by others of 300 to 500 ft. on the West, the breeze would scarcely be felt, and the heat be intolerable. This is confined to the town limits. At our observatory (Capt. Belcher's), and at the port, San Carlos, we enjoyed a constant breeze.

In all harbours there may be objectionable berths, but in that of Acapulco, if care be taken to keep in the line of what I have designated "West Gap," or neck of the peninsula open of the South point of the town bay, both land and sea breezes will be felt in their full strength, and free from causes which would heat them before entering the port, the neck being but a few feet above the sea-level.

Water of good quality was found at several points between the fort and Obispo Rock; but the two best streams are between the fort and San Lorenzo

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Capt. G. H. Richards, R.N., surveyed a part of the coast to the westward, in H.M.S. *Hecate*, in 1863, and he has given the following:—In approaching from the westward the Paps of Coyuca are a good guide; they are two distinct conical summits, and the mountain is about 4,000 ft. high; it lies N.W. by N. nearly 30 miles from Acapulco, and 20 from the coast. The land westward of Acapulco is high. At the distance of 10 or 12 miles from the coast two distinct ranges are seen; the nearer one about 2,500 ft. high; and the more distant one, of which the Paps form a portion, over 4,000 ft. When the Paps of Coyuca bear N. by E. $\frac{1}{2}$ E., a red stripe, or land-slip, will be seen on the coast right under them. A square table-topped mountain rises just westward of Acapulco, to between 2,000 and 3,000 ft. When within 8 or 10 miles of the port, Roqueta Island is seen, which has a high, yellow, cliffy coast, as also the point of the main land northward, forming the entrance of the Boca Chica.

Diamante Point, which appears as the eastern extreme of the land, shows as an island at the distance of 7 or 8 miles; the head of Port Marques, of which it forms the South point of entrance, being low. Making Acapulco, from the S.W. or southward, the entrance is remarkable, from the yellowish cliffs of Diamante Point and Roqueta Island, which may be seen at a considerable distance. The Paps of Coyuca are also seen, but the eastern peak appears cut off. There is also a white wooden tower on the summit of Roqueta Island, which is used as a lighthouse, and seen 6 or 7 miles off.

Capt. W. Walker states that in coming from the westward vessels should take their departure from Point Tejupan and White Rock Point, and steer for Morro Petatlan. Pass the latter at a distance of 2 miles, and Point Tequepa at 1 mile, and run along the beach at $1\frac{1}{2}$ mile off. At night the rock lying eastward of Roqueta may be cleared by steering about E.N.E. for Bruja Point, until Grifo Point is seen abeam, when haul up sharp for the latter point. These points are readily distinguished on the darkest nights. If there is no light on the buoy steer midway between the two gaps in the land to the right of the Company's coal sheds, and you will find it. In coming from the eastward take a departure from the White Rock off Port Angeles, and shape a course to pass just outside of Tartar Shoal.

It is high water at Acapulco, on full and change, at 8^h 6^m; the rise is about $1\frac{1}{2}$ ft. M. de Petit-Thouars states that outside the port the current runs to the S.E., varying from one-half to 2 miles an hour, being more rapid during the ebb. In case of necessity, anchorage can be obtained in the Boca Grande.

The coast to the westward of Acapulco is low, and formed by what is called the beaches of Coyuca. The swell sets so strongly upon this long, shallow, sandy bay to the West, that it is impossible to get near it in a boat or canoe; yet it is good clean ground, and good anchorage a mile or two from the shore. The land near the sea is low, and moderately fertile, producing spreading palms and other trees, which grow in clumps all along this bay. There are

also many villages. The land-wind here is generally from the N.E., and the sea-breezes from S.W.

The Paps of Coyuca, serviceable as a mark for approaching Acapulco, have been before noticed. They are remarkable and may be readily distinguished, as Capt. Belcher says, "when not obscured." According to the chart, they are in about lat. $17^{\circ} 2' N.$, long. $100^{\circ} 6' W.$

At about 71 miles W. by N. $\frac{1}{2}$ N. from Roqueta Island is *Point Tequepa*, also named *Jequepa* or *Papanoa*, with a hill on it, 527 ft. high. Between this point and an islet named *Morro de las Animas*, 112 ft high, nearly 3 miles to N. by W. $\frac{1}{2}$ W., the coast forms a slender bay, in the S.E. angle of which is a lime-kiln. According to the survey by the officers of the U.S.S. *Tuscarora*, 1879, there is anchorage in 11 fathoms, sand, at 6 cables N. by E. $\frac{1}{2}$ E. from Point Tequepa, the lime-kiln bearing S.E. $\frac{1}{2}$ S.

About 26 miles N.W. by W. $\frac{1}{2}$ W. from Point Tequepa is the *Morro de Petatlan*, 640 ft. high, which may be known by *Potoci* or *White Friar Rocks* lying a mile off it.

"The hill of Petaplan (Petatlan) is a round point stretching out into the sea, appearing at a distance like an island. A little to the West of this hill are several round rocks." Dampier anchored on the N.W. side of the hill, passing inside of these rocks, between them and the round point, where he had 11 fathoms water. According to the U.S. survey of 1879, these rocks extend half a mile W. $\frac{1}{2}$ N. and E. $\frac{1}{2}$ S., varying from 25 ft. to 200 ft. in height, with deep water close to them. In the bay to the northward of the Morro there is anchorage in 8 fathoms, sand, 3 cables off shore.

PORT SIHUANTANEJO, about 7 miles N.W. of Petatlan, was surveyed by Capt. Kellett, R.N., in 1847, and by the officers of the U.S.S. *Tuscarora*, in 1879. From their plans it would appear to be an excellent harbour, but open to the S.W. There is no hidden danger going in, and the entrance, half a mile wide, is sufficiently marked by the bold coast to require no directions. The position of the observations, at the head of the port, Capt. Kellett places in lat. $17^{\circ} 38' 3'' N.$ The U.S. officers make the position of their observation spot, about $1\frac{1}{2}$ cable S.W. of the village at the head of the bay, to be in lat. $17^{\circ} 37' 56'' N.$, long. $101^{\circ} 33' 3'' W.$ There is anchorage in 8 fathoms, sand and mud, near the centre of the port.

There is no mark by which this port can be recognised from far off at sea, so that vessels must make some known point of the coast and then coast along the shore. A large rock lies $1\frac{1}{2}$ mile S. $\frac{1}{2}$ W. from the middle of the entrance to the port. Water may be procured from a lake at the head of the bay, but it is brackish near the sea.

Istapa or Isla Grande Bay, according to the U.S. survey of 1879, is formed by the irregular-shaped Island of Istapa or Estapa, and the coast. The anchorage is in about 5 fathoms, a quarter of a mile N.E. by E. $\frac{1}{2}$ E. from the easternmost of the rocks off the North point of the island. A rock, awash,

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with 8 fathoms around it, lies $4\frac{1}{2}$ cables N. by W. $\frac{1}{2}$ W. from the same rock. On the coast, eastward of the island, is Mount Istapa, 720 ft. high.

Dampier passed along this coast, and says :—"About 2 leagues West from Petaplan is Chequetan (Sihuantanejo ?). At $1\frac{1}{2}$ miles from the shore is a small bay, and within it is a very good harbour, where ships may careen; there is also a small river of fresh water, and sufficient wood." He landed at Estapa, 6 or 7 miles to the W.N.W. of Sihuantanejo.

To the West of Estapa, Dampier says the land is high, and full of ragged hills; and West from these ragged hills the land makes many pleasant and fertile valleys among the mountains.

All this coast is lined with villages and salt-works (salines), worked by the inhabitants. The approach to the coast is clear, but there is no safe anchorage, and there is not a single important river. That of *Sacatula* or *Zacatula*, which comes from the Volcan de Jorullo, as also the *Rios Camuta* and *Coalecan*, are not navigable. Capt. G. H. Richards says that the former, on the East side of Mangrove Bluff, must be a very small one, for nothing of the kind could be made out from the masthead at the distance of $1\frac{1}{2}$ mile.

Mangrove Bluff, a low, but well-defined point, 30 to 40 ft. high, in lat. $17^{\circ} 54' 5''$ N., long. $102^{\circ} 17'$ W., is the western extreme of a deep bay, at the head of which the *Canuta* or *Salt-pits* are marked in the chart.

A high and very remarkable mountain rises over the East side of the Salt Pit Bay, and *Blancos Isles*, southward of Istapa Bay, are very conspicuous objects. They are three white islets or rocks, the easternmost being the largest, square, and something like a haystack in shape.

From Mangrove Bluff the coast trends about W. by N., nearly straight, with no remarkable feature for a distance of 52 miles to *Lizard Point*, which is low and cliffy.

Soundings.—At the distance of 8 miles eastward of Lizard Point there is from 35 to 40 fathoms, at 3 miles from the shore, which continues until approaching Mangrove Bluff; and, singularly enough, at the distance of 3 miles to the westward of the bluff, and scarcely 2 miles from the beach, there is 132 fathoms, mud bottom.

Immediately South of the bluff, and nearly 2 miles from it, there is only 14 fathoms, shingle bottom; and the same depth, or less, continues for 3 or 4 miles to the eastward, parallel with and at the same distance from the coast, when the water suddenly deepens.

Tejupan Bluff is 26 miles W. by N. $\frac{1}{2}$ N. from Lizard Point, the coast between being generally steep, and rising somewhat abruptly to 2,000 feet.

At 10 miles eastward of Tejupan is the only remarkable intermediate point. Three white rocks lie off it, in an E.S.E. direction, and a sandy bight is formed to the westward. Inside them, there is a fertile-looking spot, with a village, and probably landing, and shelter for boats.

The bluff is bold and cliffy, with two small rocky islets off it. Anchorage in 16 fathoms was found 7 miles south-eastward of the head, a mile from the shore. The hills rise in successive ranges parallel with the coast to the westward, the nearer ones from 1,500 to 2,000 ft. high, the more distant much higher.

The Paps of Tejupan, a mountain 5,867 ft. high, with a double nipple summit, lie 21 miles E.N.E. from the bluff of the same name, and although remarkable in passing up or down the coast, would scarcely be so from seaward, in consequence of the back ranges rising to a greater elevation.

Colima Mountain, 12,000 ft. high, and 15 miles inland, is visible from this part of the coast, and very remarkable when seen distinctly; but the haze, which generally hangs over the distant land, renders this seldom the case, and it therefore cannot be counted upon as a landmark. It is a saddle-shaped mountain, having two sharp conical summits, apparently nearly the same height; the horizontal measurement between them from off Tejupan Bluff is 45 miles.

Black Head is 18 miles N.W. from Tejupan Bluff, the coast between being composed alternately of sandy beach and high cliff. Black Head is a cliffy peninsula, 457 ft. high, in lat. $18^{\circ} 36' 18''$ N., long. $103^{\circ} 45' 30''$ W., and is connected to the shore by a sandy neck. A small white rock, 47 ft. high, lies half a mile N.W. of the northern extreme of the peninsula, and a bay is formed to the northward of the rock, where there is anchorage in fine weather in 14 fathoms, $1\frac{1}{2}$ mile off shore.

Marnata, a new Mexican port, is situated between Tejupan Bluff and Black Head, in lat. $18^{\circ} 27'$ N., long. $103^{\circ} 33'$ W., according to Commander Mainwaring, H.M.S. *Cameleon*, 1874. The village, consisting of the custom-house (a hut) and four or five Indian huts, is situated on the North side of a creek communicating with a large lagoon. The anchorage is bad, being exposed to all winds from seaward, except N.W., and the shelter from that quarter is indifferent; the bottom is loose sand. Coasters anchor in $3\frac{1}{2}$ fathoms, about a cable from the shore.

Food is scarce, and water bad. The locality is unhealthy. Communication with the interior is by bridle paths only, the nearest town of importance being Colima, 150 miles distant. Brazil-wood is shipped during the fine season occasionally.

Gold diggings exist on the River Ostula, about 15 miles northward of Marnata, and silver mines near Cualeoman, a town situated 120 miles in the interior, and containing about 1,500 inhabitants.

From Black Head the coast trends about W.N.W. 43 miles, to the eastern point of Manzanilla Bay; it is low and sandy, varying from 20 to 27 ft. in height.

MANZANILLA was visited by Sir Edward Belcher in 1838, and by Capt. G. H. Richards in 1863. The bay (or harbour) is about 5 miles wide, and is

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divided into two bays on the North side by *Punta de la Audiencia*. The bay to the East is Manzanilla, and that to the West *Santiago* or *Browning Bay*, and this is the best watering-place. Sir E. Belcher states that the bay is small but safe, the anchorage is good, but the water brackish.

The port is well protected against the southerly winds prevalent during the rainy season; but, on account of a very considerable lake of stagnant water in its immediate neighbourhood, it is very unhealthy during the summer. Infested by myriads of mosquitoes and sand-flies, even in the dry season, it is nearly impossible to reside there. It has been open to foreign commerce for many years, but has not been able to make much progress. Till lately, the port itself had only a few houses and huts in the S.E. part of the bay, but the population is now said to be over 4,000; the first adjacent town is Colima, 80 miles inland, with which it is connected by a railway. It is a coaling depôt for the mail steamers, and silver ore is also shipped here.

Capt. G. H. Richards gives the following account of it:—

White Islet, or *Piedra Blanca* of Manzanilla, lies off the eastern extreme of the sandy beach which runs in almost a straight line for 13 miles from Cape Graham, at a mile from the shore. It is a quarter of a mile long and 300 ft. high, wedge-shaped when seen from the westward, and remarkably white, being the resort of numerous sea-birds. This islet is the mark for Manzanilla Bay, and may be seen from the westward immediately on rounding Navidad Head, a distance of nearly 20 miles; it then appears just inside the extreme of the land. It can be seen easily from a vessel's deck at a distance of 15 miles, when bearing from E. $\frac{1}{2}$ S., round by North to W.N.W.

Manzanilla Bay is known by this white islet $2\frac{1}{2}$ miles westward of its West point of entrance. A high rock lies close off this point; and another white rock, resembling a sail, at a quarter of a mile off the eastern point. From the westward they are both remarkable. Approaching Manzanilla from the westward, the *Vigia Grande*, a remarkable cone-shaped hill, will also be seen just inside the sail rock. It is 740 ft. high, and rises immediately over the anchorage. As neither the houses nor shipping can be seen from seaward, this is a good mark to steer for, passing from $1\frac{1}{2}$ to 2 miles outside White Islet, and the same distance from the West point of the entrance, when the *Vigia Grande* will bear E. $\frac{1}{2}$ N., and may be steered for.

This course will lead more than a mile southward of or outside the *Sisters*, a group of five rocks, the largest of which is 10 ft. high. They lie in a direct line between the West point of entrance and the *Vigia Grande*, distant from the former $2\frac{1}{2}$ miles. A very remarkable table-topped mountain, 2,600 ft. high, rises over the western point of the bay, and is an excellent guide for the port. The anchorage is immediately under the *Vigia Grande*, about one-third of a mile from the village, in 9 or 10 fathoms, over mud and good holding

North Pacific.

ground. The West end of Manzanilla village is in lat. $19^{\circ} 3' 13''$ N., long. $104^{\circ} 20' 41''$ W.

The bay is safe with all winds except gales from West or S.W., which do not occur between the months of November and June—the dry season, and singularly enough, the least healthy; fevers and ague prevail, more or less, at all times, but are more fatal during the dry season. It is not recommended to lie here more than four or five days at a time, and to take an off-shore berth, where the sea breeze will reach.

Supplies.—Fresh beef and vegetables, as well as other necessities, can be obtained here. Fresh water should on no account be received on board, and it is desirable that the crews of vessels should land as seldom as possible, and not be exposed in boats when avoidable."

Water of tolerable quality may be got from a small brook across the bay, about N.W. from the anchorage. For the purpose of procuring it choose, if possible, a very calm day. Stow the casks to be filled in the long boat or launch, and anchor it near the brook at the back of the surf. Hire a canoe to land the casks, with some iron-bound hogsheds, which are to be rolled across the strand to the brook, and then filled, which done, haul them with a running line to the boat, and fill the casks.

The tide occurs every twenty-four hours, the flood in the morning and the ebb in the evening. It rises about 7 ft., and the current runs to the South. Good pearls, &c., may be had.

Manzanilla is about 20 or 30 leagues' distance from the city of *Colima*, the capital of the territory of that name. The road from the sea is sufficiently good for carts. Except frequent earthquakes and goitres, with which the inhabitants are affected, there is nothing remarkable in the city, which contains about 30,000 inhabitants, wholly occupied in agriculture and commerce. — *Duffot de Mofras*.

At about 24 miles to the E.N.E. of Manzanilla Bay is the *Volcan de Colima*, before mentioned, the westernmost of the Mexican group. Its entire height is 12,003 ft.; it is in activity, and sulphureous vapours, cinders, and stones are emitted; but it has not discharged any lava for a long period. The diameter of its crater is 500 ft., and its mouth is perpendicular. The flanks of the mountains are barren and cliffy. The sulphur on it is of a bad quality. At 3 miles North of the volcano there is an extinct crater, which exceeds the former in elevation by 710 ft., and the height of which above the port is 12,713 ft. Its summit is covered with snow, and it may be seen at very great distances at sea, and offers, when the sky is clear, an excellent point of recognition for navigators approaching Manzanilla.

The valley in which Colima is situated seems to be formed of volcanic products and decomposed lava. The vegetation consists of palms, aloes, and superb orange trees. Above the usual level these tropical plants are replaced by forests of sombre pines.

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From 2 miles beyond the West point of Manzanilla Bay to Cape Graham, an almost straight sandy beach extends in a W. by N. direction for 13 miles, the coast being from 15 to 20 ft. high; the long lagoon lies immediately behind, and beyond again the land rises in distinct ranges to between 3,000 and 4,000 ft. During the fine season, boats may generally land on this beach, and there is safe anchorage, half a mile from the shore, in 18 fathoms.

NAVIDAD BAY lies between Cape Graham and Harbour Point, $2\frac{1}{2}$ miles apart, N.N.W. and S.S.E., the anchorage being protected from S.W. winds by the latter point. The North beach of the bay is in lat. $19^{\circ} 13' N.$, long. $104^{\circ} 44' 27'' W.$

After rounding Navidad Head from the northward, at the distance of 2 miles, the white sandy beach of Navidad Bay will be seen, bearing E. by N., distant 7 miles. *Cape Graham*, the East point of the bay, 700 ft. high, has a high peaked rock close off it, as well as a smaller one, which, however, do not show as detached from any position a vessel would be in. There is also a small rock, 6 ft. above high water, which bears from the cape S.W., distant half a mile. At 2 miles off the white rock of Navidad there is 60 fathoms water, and steering for the anchorage it gradually shoals to 40 and 30 fathoms.

As the bay is approached, Harbour Point, a very remarkable high white point, will be seen on the northern shore; immediately round and inside it is the anchorage, a very fair stopping place during the fine season, but it is not recommended for a sailing vessel at other times, as there is a difficulty in getting out with a S.W. wind. The best berth is in 7 fathoms, sandy bottom, with Harbour Point bearing S.S.W. a quarter of a mile, and the same distance from the eastern shore of the bay. Sailing vessels may anchor farther out, with the point bearing West, in 10 and 11 fathoms, but there will be more swell.

A single house stands in the North hook of the bay, and a lagoon within a few yards of the beach, where the water is fresh, and the natives say good, but it is not recommended to use it unless a vessel is in distress. At the S.E. end of the bay is the N.W. end of a long lagoon which here opens into the sea; a strong stream runs out of it, and there is sufficient depth for boats at half tide. There is a small village here, and some supplies of fresh provisions may be obtained. The anchorage off this end of the bay is not recommended.

Navidad Head, 7 miles westward of Navidad Bay, is a wedge-shaped summit, about 400 ft. high, falling inshore to a low neck, and is remarkable when seen from any direction. On approaching it, within 3 or 4 miles, it is seen to be an island, separated from the main by a low rocky ledge, which the water rises over. Off the head are three remarkable rocks, extending in a S.W. direction; the centre one being white, with a smooth round top, covered with vegetation, and about 70 ft. high. These rocks give the head some slight resemblance to Farralone Point, with the Frailes Rocks, when seen from the

N.W.; but the peculiar shape of Wedge Island would prevent the possibility of a mistake after the first glance.

The White Rock of Navidad has been mistaken for the White Islet of Manzanilla by strangers, and accidents have occurred in consequence, but this mistake could only have arisen in the absence of any chart. The Navidad Rock is small, the centre of three, and stands off a prominent headland. The White Islet of Manzanilla, 20 miles to the south-eastward, is very much larger, remarkably white, and stands alone, a mile from shore, but being rather in a bight, cannot be seen projecting from any position a vessel would be in. Besides the three high rocks off Navidad Head, there is a sunken one, which occasionally breaks, and lies S.E. $\frac{1}{2}$ E. from the White Rock, distant a short mile.

Tenacatita Bay is 5 miles wide from Navidad Head, its S.E. point, to *Brothers Point*, its N.W. extreme. The latter has a rather remarkable double hill rising immediately over it, which from the northward appears like an island. Off the point is a high, square, perpendicular rock, and some smaller ones about it above water; there are also some off-lying dangers to be avoided. *Porpoise Rock*, 7 ft. high, lies $1\frac{1}{2}$ mile W. by S. from *Brothers Point*, and a breaking rock lies S.E. by S. $3\frac{1}{2}$ cables from the same point.

The bay is spacious, and is more than 2 miles deep, and there is said to be good anchorage in its N.W. corner, well protected, with the wind from that quarter. It should, however, be entered with caution, as it has not been closely examined. A berth of 2 miles should be given to *Brothers Point*. One or two rocks were observed in the N.W. part of the bay.

Commander S. Long, H.M.S. *Fantome*, 1875, states that Tenacatita Bay affords a sheltered anchorage off the village on the East side of the bay, during the wet season, and in West Bay during the dry season. Tamarinda Bay, on the East side, also affords a secure anchorage, but there is more swell than off the village.

Tenacatita Bay is considered preferable to Manzanilla as an anchorage, and is said to be more healthy. It is easy of access, and appears free from hidden dangers, with the exception of the rock off *Brothers Point*, on which rock no breakers were visible at a mile distant, although a heavy swell was rolling in at the time. The soundings are regular, and the rocks appear steep-to.

After passing the line joining *Brothers Point* and Tenacatita Head, do not approach the West shore within half a mile, nor the East shore within a quarter of a mile. If bound to West Bay, pass eastward and northward of Bird Islet, which is 10 ft. high, and has 3 fathoms water close-to. A good berth off Tenacatita village is in 10 fathoms, with the village open northward of the outer rock off Breakwater Point, and Flat Rock (3 ft. high, and having 3 fathoms close-to) showing a little inside Tenacatita Head. From this berth the water shoals regularly towards the shore, and a vessel loading may, if desired, anchor closer in in 7 fathoms.

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Water may be procured either near the village or in Tamarinda Bay, and fire-wood is plentiful. Numerous cattle were seen in the vicinity of the bay. Coquita nut shells are abundant.

The *Frailies*, two needle-shaped rocks, from 80 to 100 ft. high, lie about 5 miles W. by N. of Brothers Point, and 6 miles south-eastward of *Farralone Point*, which is low and projecting. They are at half a mile from the shore.

Flat Top Point is 8 miles north-westward of *Farralone Point*. Over this point, the South extreme of Perula Bay, rises a remarkable flat-topped mountain, 1,100 ft. high, which is very conspicuous from the northward and westward.

PERULA BAY, according to Capt. Richards, R.N., is a spacious and convenient anchorage, 60 miles south-eastward of Cape Corrientes. It is easily recognized from any direction by two islands, which lie in the centre of it; the northernmost of which, *Passarera*, 130 ft. high, is remarkable from its perpendicular white cliffs which are seen from a long distance. *Colorada*, the southern island, is rather low, and has a slightly reddish appearance.

The best anchor ge is in the northern part of the bay. The entrance is between *Rivas Point*, the N.W. extreme, and *Passarera Island*, and is a mile in breadth, the depth of water being from 15 to 13 fathoms. The North point of *Observation Cove*, at the N.W. end of the bay, is in lat. $19^{\circ} 34' 31''$ N., long. $105^{\circ} 9' 35''$ W.

Rivas Point is bold and cliffy, with some detached rocks $1\frac{1}{2}$ cable off it, the outer one 30 ft. high. From this rock a reef, 2 ft. above high water, and on which the sea always breaks, lies East, distant $1\frac{1}{2}$ cable, with deep water close to it. There is anchorage anywhere within a line between *Rivas Point* and *Passarera Island*, in from 10 to 14 fathoms water, but the most sheltered is with the high rock off *Rivas Point*, bearing S.W. by S., distant about half a mile, or midway between it and the sandy beach on the eastern side of the bay, where there is 4 and 5 fathoms at $1\frac{1}{2}$ cable from the beach. Small vessels may anchor in the northern bight of the bay, and be more out of the swell.

At the S.E. end of the bay, nearly 4 miles from *Rivas Point*, is the village of *Chamela*. Vessels wishing to anchor near it should enter between *Colorada Island* and the small islands to the S.E. of it. This channel is two-thirds of a mile wide, and free from danger. Large vessels may anchor in 8 fathoms, with the South point of *Colorada Island* bearing S.W. by W., and the village of *Chamela* just open of *San Pedro Island*, midway between the island and the shore of the bay. Small vessels may anchor in 4 fathoms inside *Cocina Island*, where they will be two-thirds of a mile from the village. Inside this it shoals rapidly, and off the village there is only a fathom of water.

From *Passarera Island* a bar extends to the opposite sandy point of the bay, distant two-thirds of a mile. The least depth of water on it is 3 fathoms, so that vessels of greater draught cannot pass from the northern anchorage to the southern part of the bay, but must go outside the islands. The bottom is

sandy, but good holding ground. During the fine season, from November till June, the sea breeze from N.W. is regular during the day, and the land wind at night, and the anchorage is perfectly safe; but with S.W. or S.E. winds a heavy swell sets in every part of the bay.

Supplies of fresh beef, pumpkins, and water-melons, may be had at the village, by giving a day's notice; there is also good water from a stream, close to it. Dye-wood is exported, but of an inferior quality.

About 60 miles N.W. $\frac{3}{4}$ N. from Rivas Point is Cape Corrientes, immediately southward of which a sandy beach commences, the general features inland being conical peaks. Soundings are obtained 4 miles South of the cape, and at the distance of 3 miles from the shore, in from 45 to 55 fathoms, and whenever a sandy beach line is observed, 19 or 20 fathoms water will generally be found within a mile of it, where vessels may anchor if necessary; but the coast is not considered safe between June and the end of November, during which time S.E. and S.W. gales are prevalent, bringing in a heavy sea.

Capt. W. H. Parker says:—I must caution you against one of the most marked currents on the coast: the current running from the East point of Navidad Bay along the coast towards Cape Corrientes, generally about N.W., but sometimes setting North, with considerable velocity into Navidad, Tencatita, and Perula Bays.

CAPE CORRIENTES, a bold headland, 425 ft. high, with rather a flat summit, rises inland to between 2,000 and 3,000 ft. From the northward and westward it is not remarkable, but from the southward it is bold and projecting. There are no known dangers off it, and soundings were not obtained with 106 fathoms, at 4 miles West of it. Its extremity is in lat. $20^{\circ} 25' N.$, long. $105^{\circ} 43' W.$ *

The cape is a bold and well-characterised promontory, jutting far into the sea, with a tolerably straight sky-line, broken here and there by ravines and small peaks. It is everywhere clad with underwood to the top, and has the appearance of being a safe, bold shore. Sandy beaches were noticed at different places, but in general the cliffs appear to be washed by the sea. At about $6\frac{1}{2}$ miles southward of the cape is *Cucharitas Reef*, which extends from the coast, and is stated to have two sunken rocks, at half a mile off its extremity, and 2 miles from shore. On the chart from the survey by the officers of the U.S.S. *Ranger*, 1882, this reef is shown as extending only about half a mile off shore.

During the years 1873-5, Commander Dewey, and the officers of the U.S.S. *Narragansett*, were engaged in surveying the coasts and islands of Mexico

* **RICHMOND ROCKS**, said to lie 8 miles W.S.W., or 13 miles W. $\frac{1}{2}$ S. from the cape, from the report of Capt. S. Richmond, 1865, are believed not to exist. The natives and others employed in the coasting trade for many years assert that there is no such rock; it was carefully sought for by the U.S.S. *Saginaire*, 1869, without success.

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* Remarks on the Co
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between Cape Corrientes and the United States frontier. We have incorporated the information thus obtained in the following description.*

Banderas Bay.—Beyond Cape Corrientes, which all ships from the South should make in going to San Blas, is the great *Bay of Valle de Banderas*, where foreign ships sometimes take in the Brazil-wood, with which the country abounds. At $23\frac{1}{2}$ miles N. by E. $\frac{1}{4}$ E. from Cape Corrientes is *Punta Mita*, the northern point of the bay, which extends about 20 miles eastward of this line. The northern and southern shores of the bay are high, but at its head the shore is low, sandy, and covered with bushes.

About a mile to the eastward of Cape Corrientes is the small harbour named *Corrales*, but the water is very deep for anchorage. It is stated that a vessel could lie here in perfect security, by anchoring near the land, and getting out fasts. A sunken rock, breaking in rough weather, lies off the harbour, about 3 cables from the shore. About 4 miles N.E. $\frac{3}{4}$ E. from Cape Corrientes is *Point Iglesia*, recognised by a large rock nearly a mile off the land. About a mile outside this rock, it is stated there are two reefs with 9 ft. water over them, but these dangers do not appear on the latest American charts.

At 12 miles E.N.E. of *Iglesia* Point is the harbour at the entrance of the small *River Ylapo*, where vessels can anchor in 15 to 20 fathoms, and obtain fresh water. At *Quemisto*, $3\frac{1}{2}$ miles farther, are some houses for the Brazil-wood cutters. The *Arcos*, at 5 miles beyond *Quemisto*, are three rocks near the shore, 210 ft., 20 ft., and 30 ft. high respectively. At 4 miles N.E. by N. from the *Arcos* is the village of *Penas*, at the mouth of a stream called *Rio Real*; vessels come here for dye-wood, and in favourable weather can anchor close to the beach, and obtain good fresh water from the river.

At 4 miles N.W. of the *Rio Real* is the *Boca de Tomates*, the outlet of a lake, also known as the *Rio Ameca*. At 7 miles farther N.W., the coast continuing low and sandy, is *Point Piedra Blanca*, eastward of which is good anchorage in 4 to 10 fathoms, during N.W. winds.

Punta Mita, 8 miles westward of the latter point, is a low, narrow, and projecting point, with many outlying rocks and reefs, one of which, under water, lies half a mile southward of it. About a mile inland is a prominent hill, 590 ft. high. At $1\frac{1}{2}$ mile eastward of the point there is anchorage in 7 or 8 fathoms in N.W. winds.

At $3\frac{3}{4}$ miles S. by W. $\frac{1}{4}$ W. of *Punta Mita* lies the northernmost of three small islands named *Las Tres Marietas*, the channel between being safe and clear by keeping nearer to the islands. This island is 104 ft. high, and about a mile to the S.W. is the second island. The outer one, 8 miles S.W. by S. from *Point Mita*, is a white rock 40 ft. high, with a smaller one 15 ft. high, half a mile to the westward. A very dangerous rock, nearly awash at high water, lies between the outer and centre *Marieta*, rather nearer the latter.

* Remarks on the Coasts of Lower California and Mexico, by Commander George Doway, U.S.N., Washington, 1874.

Corvetana, 17 miles W. by S. $\frac{1}{2}$ S. from Punta Mita, and 21 miles N.W. by N. $\frac{1}{2}$ N. from Cape Corrientes, is a bare whitish rock, 25 ft. high, and 3 cables long East and West. When seen from the southward it appears in three summits. The water appears to be deep around it, except on its western side, where a reef extends a short distance off.

From Punta Mita the coast, bordered by hills 300 to 1,000 ft. high, trends $21\frac{1}{2}$ miles N.E. by N. $\frac{1}{2}$ N. to *Punta Raza*, a reddish-coloured point about 30 ft. high, the western point of *Jaltemba Bay*, an open bay in which ships may find shelter in S.E. winds. At $2\frac{1}{2}$ miles eastward of Punta Raza, and a mile from the shore, is a small islet, 80 ft. high, between which and the beach there is anchorage for vessels loading dye-wood.

At 10 miles N. by E. $\frac{1}{2}$ E. from Punta Raza, and northward of Tecusitan Point, is the small bay of *Chacola*, with anchorage for small vessels, and at 11 miles farther N. $\frac{1}{2}$ W. the *River Custodios* falls into the sea, southward of the point of the same name. From Custodios Point to *Camaron Point*, southward of San Blas, the distance is 10 miles N. by W. $\frac{1}{2}$ W., the coast between forming an open bay known as that of San Blas, in which there is said to be no safe anchorage.

The **TRES MARIAS** lie 60 miles to the N.W. $\frac{1}{2}$ N. of Cape Corrientes, and 70 miles westward of San Blas. They were discovered by Mendoza in 1532, and often served in after years, as a refuge to pirates and the buccaneers who secured these coasts. Dampier was here in 1686, and he says,—“I had been for a long time sick of a dropsy, a distemper whereof, as I said before, many of our men died; so here I was laid and covered all but my head in the hot sand. I endured it near half an hour, and then was taken out and laid to sweat in a tent. I did sweat exceedingly while I was in the sand, and I do believe it did me much good, for I grew well soon after.”—Vol. i. p. 276. A very singular sand bath.

The group properly consists of *four* islands, extending 38 miles N.W. $\frac{1}{2}$ W. and S.E. $\frac{1}{2}$ E. They are of volcanic origin; their western sides consist of high cliffs, and perfectly barren, while their eastern sides are generally low and sandy, with some vegetation.

Cleopha, the southernmost, is about 3 miles in diameter, and 1,320 ft. high. It has some rocks off its N.E. point; a white rock, 225 ft. high, half a mile off its western point; and a pinnacle rock, 100 ft. high, 8 cables off its S.E. point.

Magdalena, $8\frac{1}{2}$ miles N.W. of *Cleopha*, is 8 miles long East and West, and from 1 to 4 miles wide; off its S.W. side are several detached islets and rocks. In the middle of the North shore the land slopes from the summit, 1,090 ft. high, to a level sandy beach.* It is thickly wooded.

* Commander Dewey states that the highest peak of this island rises to a height of 2,384 ft., but the British Admiralty chart, taken from the U.S. survey, gives it as above. Numerous discrepancies of this sort occur between the two charts.

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Beechey, vol. ii. p. 584.
North Pacific.

Maria Madre or *St. George*, 5 miles N.W. of Magdalena, is $11\frac{1}{2}$ miles long N.W. and S.E., and 3 to 6 miles wide. Its highest point rises to 1,694 ft. (P. .020 ft.), and may be seen 50 miles off. From this point it gradually declines in elevation to its low N.W. extremity, off which a dangerous reef extends nearly a mile. The South point is 125 ft. high, and projecting, with some rocks off it. On either side of the point is a small bay, which affords shelter against the prevailing wind, protected by a sandy and rocky beach. A few people, who collect salt, reside on the S.E. side of the island.

San Juanito, 2 miles N.W. of *Maria Madre*, is the northernmost of the group, and 150 to 200 ft. high; it is $2\frac{1}{2}$ miles long N. by W. and S. by E., and at a mile off its western side is a remarkable steep white cliffy rock, 150 ft. high, resembling the S.W. side of the island of *Maria Madre*. A reef extends from the southern side of *San Juanito* towards the reef of *Maria Madre* Island, rendering this channel very dangerous.

They were surveyed by Capt. Beechey, whose directions are given below. Sir Edward Belcher also visited them in 1838, and he says:—

There is nothing inviting in either of the Marias. In the rainy season water may flow, but from what I witnessed of the channels through which it must pass, they should be well cleansed by floods before it would be fit for consumption. What remained in the natural tanks was sulphureous and brackish, although far above the influence of the sea, and formed by a strong infusion of decayed leaves. By tracks observed, turtle appeared to have visited the island lately, but none were seen or taken. Wood is plentiful, particularly a species of *lignum vitæ*. Cedar, of the coarse species, used for canoes, we met with, but none of the fine grain.

Fish appear to be numerous, particularly sharks. The capricious character of the ocean about these islands renders visits at any time hazardous, as a few moments may imprison the naturalist for weeks. Ten years since, nearly to a day, I found landing on any part of these shores impracticable, although the weather previously had been fine.

Here Vancouver tried ineffectually for water, and I was induced, by the assertion of a master of a vessel belonging to San Blas, that wells were sunk and good water conveniently to be had, to make this examination. It is not improbable that if wells were sunk water could be obtained; but is the result worth the trouble or risk?*

* The channel between the two North islands (Magdalena and *Maria Madre*) appears to be quite safe, and in the narrowest part has from 16 to 24 fathoms water; but the ground in other places is very steep, and at 2 miles distance from the shore there is no bottom with 100 fathoms. When the wind is from the northward it is calm in this channel, and a current sometimes sets to the southward, which renders it advisable, on leaving the channel, to take advantage of the eddy winds which intervene between the calm and the true breeze to keep to the northward, to avoid being set down upon *St. George's* Island.—*Beechey*, vol. ii. p. 534.

There is nothing to make it desirable for a vessel to anchor at these islands. Upon Prince George's Island there is said to be water of a bad description; but the landing is in general very hazardous. There are passages between each of these islands. The northern channel requires no particular directions;* that to the southward of Prince George's Island is the widest and best; but care must be taken of a reef lying one-third of a mile off its S.W. point, and of a shoal extending $1\frac{1}{2}$ mile off its S.E. extremity.

From the South channel Piedra Blanca del Mar bears N. 76° E., true, about 45 miles. It is advisable to steer to windward of this course, in order that, as the winds during the period at which it is proper to frequent this coast blow from the northward, the ship may be well to windward.

Piedra Blanca del Mar is a white rock, about 145 ft. high, and 140 yards in length, with 8 to 12 fathoms all round it, and bears from Mount San Juan W. $\frac{3}{4}$ N., about 30 miles. At 11 miles E. $\frac{3}{4}$ S. from this rock is *Piedra Blanca de Tierra*, a small white rock, 55 ft. high, with two smaller ones N.E. and S.W. of it, lying 8 cables S.E. $\frac{3}{4}$ S. from the entrance to San Blas harbour.

Having made Piedra Blanca del Mar, pass close to the southward of it, and unless the weather is thick, you will see a similarly shaped rock, named *Piedra de Tierra*, for which you should steer, taking care not to go to the northward of a line of bearing between the two, as there is a shoal which stretches 3 miles off the mouth of Santiago River. The course will be S. 79° E., true.

SAN BLAS.—This port has much declined in importance of late years, Mazatlan having taken away much of its trade. The town stands on a hill, with a stream of each side of it; that to the westward is named the *Estero del Arsenal*, having a depth of 16 or 17 ft. on its bar at high water, and here small vessels are perfectly sheltered. A reef extends from the West point of the estero. The eastern stream, named *San Christoval*, is almost dry at low water. Supplies of fresh beef, vegetables, wood, and water may be obtained here; the latter, of excellent quality, is found in the *Ensenada Matenchén*, 2 $\frac{1}{2}$ miles eastward of San Blas. A railway is being constructed to Mazatlan, and another between San Blas and Guadalajara, and from thence to join a line from the city of Mexico.

In making this port, the saddle-peaked mountain of San Juan, 7,550 ft. high, 18 miles E. by S. from the town, is an excellent landmark. The land to the southward of the port is high, while to the northward it is low.

To bring up in the road of San Blas, round *Piedra de Tierra* at a cable's length, and anchor in 5 fathoms, with the low rocky point of the harbour

* The mountains above San Blas may be seen towering above the vapour which hangs over every habitable part of the land near it. The highest of these, San Juan, 6,230 ft. above the sea, by trigonometrical measurement, is the best guide to the road of San Blas, as it may be seen at a great distance, and is seldom obscured by the fogs, while the low lands are almost always so.—*Beechey*, vol. ii. p. 584.

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bearing N. $\frac{1}{2}$ E., and the two Piedras in one. This road is very much exposed to winds from S.S.W. to N.N.W., and ships should always be prepared for sea, unless it be in those months in which the northerly winds are settled. Should the wind veer to the westward, and a gale from that quarter be apprehended, no time should be lost in slipping and endeavouring to get an offing, as a vessel at anchor is deeply embayed, and the holding ground is very bad. In case of necessity a vessel may cast to westward, and stand between Piedra de Tierra and the Fort Bluff, in order to make a tack to the westward of the rock, after which it will not be necessary again to stand to the northward of a line connecting the two Piedras.

The road of San Blas should not be frequented between the months of May and December, as during that period the coast is visited by storms from the southward and westward, attended by heavy rains and thunder and lightning. It is, besides, the sickly season, and the inhabitants having all migrated to Tepic, no business whatever is transacted at the port.

It is high water at San Blas, on full and change, at 9^h 41^m; springs rise between 6 and 7 feet.

Capt. Basil Hall says:—

Having passed about 8 or 10 leagues to the southward of the group called the Tres Marias Islands, steer a N.N.E. course, until Piedra Blanca comes in sight, when it would be advisable to steer directly for it, and pass about a league or two to the southward of it; from thence you will see Piedra Blanca de Tierra, which points out the harbour; for this you may steer direct, taking care not to go in-shore of the line of bearing of the two rocks, as a sand-bank lies off the coast about halfway between them, to a considerable distance, on the pitch of which there is only 2 $\frac{1}{2}$ fathoms.

The watering-place is at a well dug near the end or commencement of a rope-walk, on the beach. The water is sometimes brackish, but improves by keeping.

Plenty of fish are to be caught at the anchorage, and oysters are found clustered to the roots of the trees on the banks of the river.

Early in June the rainy season commences with great violence, like the monsoons of the East Indies, and continues for six months, during which period there prevail violent squalls, a heavy rolling sea at the anchorage, thunder and dangerous lightning, and almost constant rain. The inhabitants, at this season, retire to the neighbouring town of Tepic, and to other parts of the country, not only to avoid the bad weather, but the ardent fevers which are prevalent.

In the evenings and mornings the air is so filled with mosquitoes and sand flies, that those periods, which otherwise would be the best to work in, are not the most suitable for communicating with the shore. There is always reason, too, to apprehend the effect of marsh miasma, in the mornings and evenings, at a spot so surrounded with swamps. There is no doubt, however, that this

place is extremely unhealthy at times, and every precaution, especially against exposure at night, would be at all times of importance.

The following is by Capt. Masters :—"In the rainy season, when the wind blows strong from the southward, a heavy swell sets in at San Blas, and as there is nothing to protect the anchorage, it must be felt very severely; but I never heard of any damage having been done to the shipping in consequence.

"There is some advantage in a vessel lying outside in the roads during the rainy season, for there the crews have purer air to breathe; and probably it might be more healthy than that of the port, besides being partially clear of mosquitoes and other tormentors of the same caste, which are very numerous. The crew also are easier kept on board. But if the ship has to discharge her own cargo, the expenses of doing it will be considered; and if her long-boat is too small for that purpose, the launch, which must be hired, will most likely be manned by the crew; so that they are more liable to become ill, being more exposed to the rain and sun, than if a vessel was in the port; and, in the next place, their meals would not be very regular; they would also get spirits by some means, whoever was in charge of the boat or launch (providing that he should be even disposed to prevent it), whenever she went on shore.

"There is 13 ft. water on the bar of San Blas, in the shallowest part of the entrance, and very seldom less even in the neaps. By giving the point which forms the harbour a berth of 15 or 20 fathoms, you will avoid a large stone, which is awash at low water, and is about 8 fathoms from the dry part of the rocks or breakwater. As soon as you are so far in that the innermost or eastern part of the breakwater is in a line with the other part of it inside, which runs to the N.N.E., it may be approached to within 10 or 15 fathoms, and by keeping well off from the low sandy point on the starboard hand as you warp up the harbour, you will have the deepest water. But as the sea sometimes in the rainy season (although but seldom) breaks over the breakwater which forms the harbour, it would be best to moor close under the high part of the land on which the old ruins of a fort stand, with the ship's head up the river, and a bower laid off to the eastward, and an anchor from the starboard quarter, from the larboard side to the shore, either by taking an anchor out or making fast to the rocks. It would be next to impossible that any accident could happen to the ship; the cargo can also be discharged with dispatch, and immediately under the eye of the master or mate, as the place where the cargo is landed would be about 100 fathoms from the ship. The ship's long-boat would do more inside than two launches if she was outside; and besides, when the sea is heavy in the roads, the discharging of the cargo could go on. As there are no established pilots here, it would be advisable to engage a person to point out where the stone lays. The captain of the port is the best to apply to, and if he does not come off himself, would most likely recommend a person."

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the land not to go to leeward of San Blas, as there is a strong southerly current along the coast, especially off Cape Corrientes.* If possible, keep San Blas on an E.N.E. bearing. The Tres Marias Islands, off the port of San Blas, are convenient points for making; and here a master could leave his vessel in perfect safety to water while he communicated with his consignees, or got his overland letters from his owners at home. There is a safe mid-channel course between the middle and southern islands. We brought a saddle-shaped hill on the main a little South of San Blas, one point open of the South island, and steered by compass N.E. by E.

The two Piedra Blancas are excellent marks for the roadstead. A good anchorage for vessels awaiting orders (for which purpose San Blas is now almost alone visited, except by English men-of-war, and Yankee clippers for smuggling purposes) will be found with Piedra Blanca del Mar, N. 70° W., Piedra de Tierra, N. 43° W., and the village in the Estero, N. 26° W.

Since the days of Hall and Beechey, the town of San Blas has very much changed. Its population of 20,000 has dwindled to 3,000, and their unwholesale trade has been transferred to its rival, Mazatlan.

The large town of Tepic, in the interior, with a small factory (then owned by an English merchant), causes a small demand for European luxuries, and a cargo or two of cotton; which petty trade is carried on during the six healthy months in the year.

The town is built on the landward slope of a steep hill, almost perpendicular to seaward, its crest crowned by the ruins of a custom-house; but this being about three-quarters of a mile distant from the beach, a large assemblage of huts has been formed at the landing-place in the Estero del Arsenal, for the convenience of supplying the shipping. The old town is now in ruins, and the new town has scarcely 600 inhabitants.

In the Estero del Arsenal, small craft of less than 10 ft. draught will find convenient anchorage, means of heaving down, &c. The watering-place is at least 3 miles distant from the above anchorage, and to assist the boats in this heavy work, it would always be advisable to shift the vessel into such a position that they might make a fair wind off and on whilst the daily sea-breeze blows.

The watering-place is at the northern extremity of a large open bay South of San Blas. The beach is shoal, and the casks have to be rolled 300 or 400 yards through the jungle to a stream of water. The stream during the spring tides is liable to be found brackish, but even then we succeeded in obtaining

* Capt. Beechey came to San Blas from the northward, and on approaching it found himself more to leeward than he was aware, in consequence of the current setting out of the gulf. To save time he passed between the two northernmost islands, and in doing so was becalmed for several hours, fully verifying the old proverb that the longest way round is often the shortest way home. — *Beechey*, vol. ii. p. 584.

supplies, by immersing the empty cask with the bung in such a position that only the fresh water (which of course would be on the surface) could enter.

By rigging triangles with spars in such a position that the boats could go under them to load, we succeeded in embarking daily 32 tons of water.

Many useful and ornamental woods are to be procured on shore, for the mere trouble of cutting, especially *lignum vite*. Fresh beef we found good in quality. Game moderately plentiful; oysters good and abundant; vegetables scarce and expensive. The climate may be summed up by the word *execrable*.

Mr. Jeffery, R.N., thus describes his passage from Acapulco to San Blas, which will form a fitting supplement to the preceding:—

On the 8th of December, 1833, we weighed with a light sea-breeze, which enabled us to work out of the harbour. Towards the afternoon the wind increased from the westward, and continued to blow fresh for thirty hours, which is considered unusual on this part of the coast. We were nearly 60 or 70 miles off the land, and for the next ten days had nothing but calms and light variable airs alternately, and the weather excessively hot and sultry. At last we got in with the land, about 100 miles West of Acapulco, and on the 21st were off Point Tejupan. The only remarkable objects on this part of the coast are the Paps of Tejupan; they are two sharp hills on very high land. We now found the good effects of being close in shore, and I think it advisable for vessels making this passage to keep as near the land as possible, for in the daytime we had a regular breeze from the westward. It fell light about sunset, and then about 10 or 11 o'clock the land-breeze would come from the N.E. The advantage of keeping in-shore can seldom be doubted when we consider that vessels are frequently 40 or 50, and sometimes 60 days making this passage, through not keeping near the land. Between Tejupan and Cape Corrientes we found a current setting along the land to the westward from 12 to 15 miles a day. On the 28th, when within 30 miles of the harbour, we had very heavy rain and thick weather; we arrived on the 29th, and made the passage in 21 days. After rounding Corrientes, if the weather is clear, you will see the saddle mountain near San Blas; and to the N.W. of it another high mountain, with a remarkable peak at its N.W. extremity. If you look at it with a glass it will appear split in two, but to the eye it appears as one. This is so very remarkable that it ought never to be mistaken, as there is nothing like it on this part of the coast. When the above peaked mountain bears N.E. the anchorage at San Blas will bear N.E. also.

The watering-place at San Blas is in a bay to the eastward of the roads; you have to land the casks and roll them about 300 yards through the woods to a river. At high water it is rather brackish, but at all other times the water is excellent. Wood is very plentiful.

The fine season lasts from December to May inclusive. During that interval the sky is always clear, no rain falls, land and sea-breezes prevail; and, as there is no sickness, the town is crowded with inhabitants. From June to

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November a very different order of things takes place; the heat is greatly increased, the sky becomes overcast, the sea and land-breezes no longer blow, but in their stead hard storms sweep along the coast, and excessive rains deluge the country, with occasional violent squalls of wind, accompanied by thunder and lightning. During this period San Blas is rendered uninhabitable, in consequence of the sickness and of the violence of the rain, which not only drenches the whole town, but by flooding the surrounding country, renders the rock on which the town is built literally an island. The whole rainy season, indeed, is sickly, but more especially so towards the end, when the rain becomes less violent and less frequent, while the intense heat acts with mischievous effect on the saturated soil, and raises an atmosphere of malaria such as the most seasoned native cannot breathe with impunity.

This being invariably the state of the climate, nearly all the inhabitants abandon the town as soon as the rainy season approaches, that is, by the end of May.

The whole of the coast about San Blas, Mazatlan, and Guaymas, is perfectly clear, and may be approached to within a short distance.

The year is divided into the two seasons described above. It must be remarked that the change occurs gradually, and its period varies. During the dry season the weather is constantly fine. The winds blow regularly during the day from N.W. to West, following the direction of the coast, and give place during the night to a slight land-breeze or calms. The rainy season, which commences in June, is first indicated by calms and slight showers of rain. As the season advances the showers become heavier, and instead of beginning at night, they do so in the afternoon, and terminate by violent storms, accompanied with very dangerous lightning and thunder, the fierce winds blowing from all points of the compass. The weather keeps of this nature until the end of September, and it sometimes happens that the season terminates by a terrible hurricane, which generally occurs from the 1st to the 5th of October, the festival of St. Francis.

These hurricanes, which always blow from S.E. to S.W., are of short duration, but they are so violent, and raise such a heavy sea, that nothing can resist them. They are called in the country the *Cordonazo de San Francisco* (the lash with St. Francis's cord or belt). A vessel surprised when at anchor ought to slip her cables, or cut the moorings, and make sail. At the approach of the cordonazo she ought to gain an offing, or if obliged to keep in the road, to moor at such a distance off shore that she can easily get under sail on the first intimations of its approach. These observations are not applicable to roadsteads entirely open, but such ought to be avoided during the months of September and October. Sometimes the cordonazo occurs later than St. Francis' day; thus, on the 1st of November, 1839, twelve ships, who thought it had passed, were surprised in the Port of Mazatlan, and the greater part were lost, and all perished. On the 1st of November, 1840, three vessels were

lost in the road of San Blas, and several people were drowned, without it being possible to render them any assistance.

A monsoon has been observed on the N.W. coast of Mexico, and in the Gulf of California, arising from the *inversion of the trade winds*. In reality, this wind, almost constantly blowing from the N.E. in the Atlantic, in the parts North of the equator, is here supplanted by one from the S.W., and even by winds directly from the West. This inversion, which only prevails in the Vermilion Sea, is not experienced on the Californian coast, washed by the Pacific, beyond the latitude of 23° North.

Between San Blas and Mazatlan, 120 miles to N.W. $\frac{1}{4}$ N., the shore is generally low and covered with trees or bushes. At 8 miles W. by N. $\frac{3}{4}$ N. from the entrance of San Blas harbour is *Santiago River*, off which a dangerous shoal extends nearly 3 miles towards Piedra Blanca del Mar. At 4 miles and 12 miles farther respectively, N.W. by N., are the entrances to the *Asadero* and *Camichin Esteros*, frequented by vessels for cedar, dye-wood, &c.; the anchorage is in 5 or 6 fathoms, half a mile from the beach.

Isabel Island, about 40 miles W.N.W. from San Blas, and 22 miles W. $\frac{1}{2}$ N. from the Boca Camichin, is 280 ft. high, and nearly barren. It is $1\frac{3}{4}$ mile long N.W. by N. and S.E. by S., and about half a mile wide; neither wood nor water can be obtained on it, and it is only frequented by sealers. The beach is generally lined with rocks, but there is a small sandy cove, open to the West, where boats may land, which they may also do, in fine weather, at several sand beaches on the East and S.E. sides of the island. There are several detached rocks around it, the most conspicuous being two whitish pinnacle rocks, 90 ft. and 75 ft. high, near its N.E. side.

Boca Tecapan, 45 miles N.W. by N. $\frac{1}{4}$ N. of Boca Camichin, is the mouth of the *Rio Bayona*, inland of which are the hills of the same name. The anchorage is in 6 or 7 fathoms, about 2 miles from the entrance. Two channels lead into the estero, the northern one having a depth of 12 ft., and the southern 15 ft. at high water. The bar breaks even in moderate weather; the best time to enter is in the early morning, before the sea-breeze springs up. Fresh water may be obtained from an Indian village near the entrance.

At 23 miles N.W. $\frac{3}{4}$ W. from Boca Tecapan is the *River Chamatla* or *del Rosario*, only navigable by small boats in the dry season, to the towns of the same name. The anchorage is in 6 or 7 fathoms, a mile off the river's mouth. It was in the small port formed by this river that Hernan de Cortes embarked, April 15th, 1535, on his voyage to discover California.

Near the mouth of the Chamatla are the Chamatla Hills, 560 to 785 ft. high, and midway between these and Mazatlan, and 9 or 10 miles from the coast, is a remarkable range of hills, 1,200 to 1,765 ft. high, known as *La Cabeza de Caballo*. Farther inland the mountains are much higher. At 23 miles N.W. $\frac{1}{4}$ W. from the Rio de Chamatla, and 10 miles from Mazatlan, is the *Rio Barron*, a similar stream. The lead is a good guide in

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beating up the coast between San Blas and Mazatlan, the soundings being regular.

On the coast several large farms are seen after leaving San Blas. These are the haciendas *Del Mar*, *San Andres*, *Santa Cruz*, *Teacapan*, *Del Palmito*, &c. Bullocks may be bought at them, and some vegetables. The water of all the rivers is good, and fine wood very abundant.

MAZATLAN, as before stated, has supplanted San Blas in its commerce, and consequent importance. It was surveyed in 1827 by Capt. Beechey, who places the extreme bluff of Creston Island, lying off it, in lat. $23^{\circ} 11' 40''$ N., long. $106^{\circ} 23' 45''$ W.; later observations place it 3' more to the westward. Considerable changes are said to have taken place since that time in the depth in the port.

The harbour of Mazatlan is entirely open to the winds which are most dangerous in the rainy season. It is formed by a bay, in the centre of which stands the town, but small vessels only can approach it. Larger ships anchor to the southward, under the lee of *Creston Island*, a small island, 484 ft. high, forming the North side of the road. It is of a roundish form, and green at the top, but is perpendicular seaward, so that it appears only as a white cliff. Creston is separated from another island, *Azada*, by a narrow rocky channel, and this last from the main land by a cable's length. In approaching Mazatlan, Creston will be first made out, seemingly detached from the coast. At 4 and 5 miles N.W. of it are two barren rocky islets, called *Venado*, or *Deer*, and *Pajaros*, 510 ft. and 360 ft. high respectively, which at a distance will appear like two patches on the coast, and will also serve to make out the anchorage, for it is the only point on this part of the coast where there is a group of islands; these islands are connected with the coast by flats of $2\frac{1}{2}$ to $2\frac{3}{4}$ fathoms water. The anchorage used is that to the South of Creston, but these islets form between them and the main land another road, formerly used by the Spaniards, which is much to be preferred in the rainy season, being sheltered from the South and S.W. winds, which prevail from the middle of June till the end of October, and blow heavily at times, and give it the advantage of getting away between the islets, or between them and the coast; but as the prevalent N.W. winds of the dry season blow right into it, and raise such a heavy sea on the beach, that landing goods, &c., is a very difficult task, the anchorage South of Creston, where these inconveniences are not felt, is preferred.

Light.—On the summit of Creston Island is a square white tower, with a red lantern, which shows a *fixed bright* light, visible 20 miles in clear weather. This light was first exhibited on November 1st, 1879.

At 6 cables north-westward of Creston Island are the North and South *Hermanos*, two rocky islets a quarter of a mile apart N.E. and S.W., a small reef extending off the East point of the former. The southern islet, 152 ft. *North Pacific*.

high, has several detached rocks around it, and at $2\frac{1}{2}$ cables W.N.W. of it is *Tortuga Rock*, about 5 ft. high. *Ciervo Island*, 250 ft. high, lies on the East side of the entrance to the harbour, and is connected with the shore by very shoal water; about 2 cables S. by W. $\frac{1}{2}$ W. from its S.W. point is *Blossom Rock*, with only 10 ft. over it, marked by a flag buoy. *Black Rock*, 7 ft. high, lies nearly three-quarters of a mile South of the same point.

The port of Mazatlan has been opened to foreign commerce for many years. Under the Spanish dominion it was unknown, but on the proclamation of the Mexican independence it was placed on a different footing; and Capt. Sir E. Belcher says, that between his former visit in 1827 and that in 1839, it had increased from a village to a town. Silver, copper, and dye-woods are the chief articles of export.

The official name which was applied to it by the Mexican government is *La Villa de los Castillos*. The population is less during the rainy season, but rises to 16,000 or 17,000 at the dry season, or when the vessels arrive. It has a very picturesque appearance both from land and sea, the houses being all light coloured, and in the better parts of the town handsome and commodious, the style being that of the old Castilian, suitable to the hot climate.

The town stands on the East side of the peninsula, and about a mile within the entrance of the river, on the bar of which there is only 6 ft. at low water. The custom-house is at the South end of the town, and from it a pier extends, southward of which is another for boats. Sunken rocks lie off the shore between this and the fort, making it necessary for boats to give it a good berth. At the back of the fort is a hill, 200 ft. high, on which is a Signal Station. Supplies are said to be dear, and only rain water can be procured. There is a hospital at the town. The mail steamers call here, and a railway is being constructed to connect it with San Blas.

Ships ought to get their water in the peninsula which forms the South side of the road; everywhere else it is brackish. Although Mazatlan is less unhealthy than San Blas, severe fevers are common during the rainy season. Commanders should be strict in not allowing their men to run into any excesses, which are highly dangerous.—*M. Duflot de Mofras*.

It is high water, on full and change, at 9^h 40^m; springs rise 7 ft.

About 13 miles to the eastward of the port, on the road leading to San Blas and Tepic, and 6 miles from the sea, is the old Presidio of Mazatlan. There are no vestiges of the fortification, and the fine barracks built by the Spaniards only serve now to shelter a few cavalry soldiers. The Rio de Mazatlan, which runs near the Presidio, and falls into the harbour, is not navigable.

Capt. Sherard Osborn, R.N., speaks rather more favourably of the climate. He says (1846):—The conasters run up the river to the new town of Mazatlan, which has risen to considerable importance within a very recent period, notwithstanding the disadvantages it labours under from the paucity of supplies,

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both animal and vegetable, and from the water being both bad and scarce. Mazatlan is now the outlet for the products of the valuable mining district of San Sebastian, and imports directly large cargoes of English goods. The general healthiness of the climate, as compared with its neighbour San Blas, has materially tended to an increase of its population. The town, from being built on the crest of some heights, clear of mangrove and swamp, had an air of cleanliness and pure ventilation rare in this part of America. Vessels invariably moor in the roadstead, open hawse to W.S.W., and too close a berth to Creston Island is not advisable, as the squalls sweep over it with great strength.

Capt. Beechey's directions are as follow:—

The anchorage at Mazatlan, at the mouth of the Gulf of California, in the event of a gale from the south-westward, is more unsafe than that at San Blas, as it is necessary to anchor so close to the shore, that there is not room to east and make a tack. Merchant vessels moor here with the determination of riding out the weather, and for this purpose go well into the bay. Very few accidents have, however, occurred, either here or at San Blas, as it scarcely ever blows from the quarter to which these roads are open, between May and December.

There is no danger whatever on the coast between Piedra del Mar and Mazatlan; the land is a sure guide. The Island of Isabel is steep, and has no danger at the distance of a quarter of a mile. Beating up along the coast of Sonora, some low hills, of which two or three are shaped like cones, will be seen upon the sea-shore. The first of these is about 9 leagues South of Mazatlan, and within view of the island of Creston, which forms the Port of Mazatlan. A current sets to the southward along this coast, at the rate of 18 or 20 miles a day.

Having approached the coast about the lat. of $23^{\circ} 11' N.$, Creston and some other steep rocky islands will be seen. Creston is the highest of these, and may be further known by two small islands, Venado and Pajaros, to the northward of it, having a white chalky appearance. Steer for Creston, and pass between it and a small rock to the southward, and when inside the bluff, luff up and anchor immediately, in about $7\frac{1}{2}$ fathoms, the small rock about $S. 17^{\circ} E.$, and the bluff $W. by S.$ Both this bluff and the rock may be passed within a quarter of a cable's length. The rock has from 12 to 15 fathoms within 30 yards of it in every direction. It is, however, advisable to keep at a little distance from the bluff, to escape the eddy winds. After passing it, be careful not to shoot much to the northward of the before-mentioned bearing ($W. by S.$), as the water shoals suddenly, or to reach so far to the eastward as to open the West tangent of the peninsula, with the eastern point of a low rocky island S.W. of it, as that will be near a dangerous rock (*Blossom Rock*), nearly in the centre of the anchorage, with only 11 ft. water upon it at low spring tides, and with deep water all round it. There may be a buoy upon it; but should this

be washed away, its situation may be known by the eastern extreme of the before-mentioned low rocky island (between which and Battery Peak there is a channel for small vessels) being in one with a wedge-shaped protuberance on the western hillock of the northern island (about 3 miles North of Creston), and the N.W. extremity of the high rocky island to the eastward of the anchorage being a little open with a rock off the mouth of the river in the N.E. The South tangent of this island will also be open a little (4°), with a dark table hill on the second range of mountains in the East. These directions will, I think, be quite intelligible on the spot.

The winds at Mazatlan generally blow fresh from the N.W. in the evening; the sea breeze springs up about 10 in the forenoon, and lasts until 2 o'clock in the morning.

To these may be added the following extract from the remarks by the French Admiral Du Petit Thouars:—

In approaching Mazatlan there is no difficulty. The latitude of the port must be gained, or rather a few minutes to the North of it, on account of the currents which generally run strong out of the Gulf of California, and which would thus send a ship to leeward of the port. In clear weather the land may be seen at 40 or 50 miles off, and, if you are on the parallel of Mazatlan, the first which will be seen will appear in the N.E., the N.E. $\frac{1}{2}$ E., or E.N.E., according to the distance. Nearing the land it will be seen successively extending towards the South as far as East, and even as E.S.E. From the offing nothing can be made out. The land on the shores is generally very low, and, in the first instance, only the interior high land will be seen; and it is only when you are within 18 or 20 miles of the coast, for example, that its different points can be distinguished. The islands of *Creston*, *Venado*, and *Ajajaro* will be made out; the first seen is Creston. As soon as all uncertainties of the position of Mazatlan cease, steer either for the anchorage of Venado or that of Creston.

In proceeding for Venado, with the ordinary winds of the season, steer for the S.W. point of Venado Island, carefully looking out for and avoiding a small rock awash, called the *Laza*, which lies about 200 yards from this point, and does not always break: after having passed this rock, which may be done within a hundred yards, bear more to the northward to enter the bay, and bring the S.W. point of Venado to bear West, or even W.S.W., according as you intend to anchor more or less within the bay.*

The subsequent description and directions are by Capt. Masters, whom we have before quoted. It must be premised, however, that his names differ in some few points from those of the Admiralty chart. We have therefore altered them to agree with that, leaving the originals within parentheses.

* Du Petit Thouars, Voyage du *Venus*, vol. ii, pp. 175-6.

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Mazatlan is a port very easily made. It is formed by a cluster of islands; to the southward of them is a long line of beach, with low land, thickly covered with trees, running several miles in before it reaches the foot of the mountains, and continues the same as far to the southward as the North side of the bar of Tecapan, where the land is high.

The port of Mazatlan, at its entrance, is formed by the island of Creston on its western, and Ciervo Island on the eastern side. From the sea the former has nearly a regular ascent, the length of the island lying from East to West, where it terminates in an abrupt precipice, and is covered with small trees. It has from 8 to 10 fathoms water to within a few fathoms of it. The Island of Ciervo has a very similar appearance, and is about half the height of Creston, being partially covered with trees. These islands can be seen several miles before the land at the back of the town makes its appearance. The outer rock is situated well outside the roadstead, and forms nearly an equilateral triangle with the islands of El Creston and Ciervo; it is about 8 ft. high, and nearly the same in breadth, and from 7 to 8 fathoms long from North to South. There is 5 fathoms water close to it.

In the excellent plan of the harbour of Mazatlan the soundings in general are very correct: but the stranger, in coming to an anchor in the night time, should not attempt to pass within the line from the outer part of Creston to Ciervo, but anchor outside in from 9 to 12 fathoms, where he will find sand and mud. Within the port is a long sand, which extends out from the bottom of it, a great part of which is dry at low water, and is shoal for some distance to the S.E., extending nearly as far as the Island of Ciervo, with a boat channel between it and the island. The inner anchorage is to the westward of this sand. It is said that the bank is increasing, and that the port has filled very much within a few years past.

In the summer season large vessels anchor between the two islands at about a third the distance from Creston to Ciervo, and moor East and West. The depth of water is from 7 to 9 fathoms, sand and muddy bottom. A vessel drawing 12 ft. water might go inside to the minor anchorage without the least risk; but, as the pilot has launches to get employed, he cannot be persuaded to take a vessel in even drawing 9 ft.

North of the island of Creston, and between it and the main land, is the island of Azada (Gomez), which is low, and is separated from Creston by a narrow boat channel. From about the middle of Azada a bar extends to the eastward across the port nearly to the sand-bank already mentioned. The pilot informed me that there were patches of shoal water on it when the water was low, not having more than 6 ft. on them, which might be the case; but where I sounded there was not less than 12 ft. Inside the bar it deepens to 4 or 5 fathoms, and close up to the town, abreast of the custom-house, at low water, there is from $2\frac{1}{2}$ to 3 fathoms, with a sandy bottom.

When the wind blows strong from the N.W. a short chop of a sea heaves in

between the island of Gomez and Point Pala (Calandare), although the distance they are apart is short; but by anchoring, as already mentioned, opposite Creston, most of it is avoided.

In the rainy season it is very unsafe to lay inside, as gales come on from the southward, which bring in a heavy sea. Vessels of all sizes anchor in this season in the outer roads, between the islands and the outer rocks, from which they can be got under way, and stand clear of the coast.

To the northward of the present port of Mazatlan, about 5 miles, is the N.W. Port of Mazatlan. It is a very fine bay, and well sheltered from the N.W. winds by Venado and Pajaros Islands. It was in the southern part of this bay that vessels formerly discharged their cargoes, but the present port being more secure, it was established in its stead.

Watering is attended with great risk at all times at Mazatlan, especially at full and change, the boats having to cross the heavy surf of the bar formed between a long spit which runs down the centre of the river, and a bank joining it from the South shore. Several boats and lives are annually lost here. In pulling in, care should be taken to cross the surf pretty close to the middle ground, and, when through the first rollers, to pull over to the South shore, and keep it on board up to the watering place. In coming out no casks ought to be allowed in the head sheets, everything depending upon the buoyancy of the boat.

The water is procured from a number of wells dug by seamen, on a low alluvial island, formed on a quicksand in the bed of the river; none of them are consequently more than 10 ft. deep. The water is by no means sweet, being merely sea-water, which undergoes a partial purification in filtering through the soil.

Capt. W. H. Parker, 1871, states that there is good anchorage in 8 or 9 fathoms, with the South bluff of Creston Island bearing W. by S. $\frac{1}{2}$ S., Black Rock S.S.E., and the town N. by W. $\frac{1}{2}$ W. In approaching this anchorage, be sure to keep Monte Silla well open westward of Ciervo Island, so as to clear Blossom Rock.

A pilot is always in attendance off Creston Island; pilotage $1\frac{1}{2}$ dollar per foot, and 5 dollars for the assistance of a boat. There is 12 ft. on the bar, but 18 ft. inside. Discharging (in large lighters) costs about $1\frac{1}{2}$ dollar per ton, and is always at the merchant's expense. Tonnage dues 1 dollar per ton when loaded; in ballast, free. Labour 2 dollars per day. Sand ballast $1\frac{1}{2}$ dollar per ton; stone ditto 2 $\frac{1}{2}$ dollars. Water 3 cents per gallon. Beef 12 cents per lb. Weights and measures are the same as those of Spain.—*Mr. Consul C. Woolrich.*

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CHAPTER III.

THE GULF AND PENINSULA OF LOWER CALIFORNIA.

WHEN Cortes had conquered Mexico, the Spanish emperor (Charles V.) granted him great titles of honour, but limited his authority to the idle command of troops reduced to inaction. Thus confined, his ardent spirit entered into new projects of extending the knowledge of the hitherto all but unknown countries in the West. In one of these expeditions California was first discovered by Fortun Ximenes, the pilot of the *La Concepcion*, a vessel sent by Cortes to explore the coast to the N.W. of Acapulco. Ximenes, having murdered the captain (Diego Bezerro), in November, 1533, to avoid the consequences sailed to the N.W., and anchored in a port which is probably on the Gulf of California, and was attacked and slain by the Indians on shore. This appears to have been the first discovery of California.

The Gulf of California was first formally explored by Francisco de Ulloa, by direction of Cortes. He had under him three vessels, which sailed from Acapulco in July, 1539. This was the last expedition of discovery in which Cortes was concerned.

The name of California is of uncertain origin. It is not known to have been used by the natives in any part of the country. It has been conjectured that it is derived from the heat of the weather experienced here by Cortes, but of this we are not told. By some it is thought that it is derived from a custom prevalent throughout California, of the Indians shutting themselves in ovens until they perspire profusely. It is not improbable that the custom appeared so singular to Cortes, that he gave it the name in consequence. It has also been considered as a corruption of *colofon*, the Spanish term for resin; the pine trees yielding it being in such profusion here.

The peninsula is sometimes called Old or Vieja California, in contradistinction to Nueva or New California, the *later* discovery, hence the appellation. California *Baja*, or *Lower*, is also a term of some antiquity; and the distinction of *Baja* and *Alta*, *Lower* and *Upper*, seems to be that now more generally recognized, since the United States have denominated their portion of the territory from its *higher* latitude.

During the seventeenth and eighteenth centuries, large quantities of pearls were procured by the Spanish adventurers, and the pearl fisheries in the Gulf of California increased in fame. At the period of its greatest prosperity, about 600 to 800 divers were employed, the fishery being carried on in small vessels of 15 to 30 tons burden. In 1831 four tolerably large vessels, from Mexico, with 180 divers, together obtained pearls to the value of £2,660.*

The PENINSULA has remained, until quite recently, almost unknown to the civilized world, and its Spanish possessors have done nothing to explore its capabilities, in all the centuries it has been in their possession. The maps, therefore, have been strangely defective. But since Upper California has been developed into one of the most prosperous countries in the world, a new interest in it has been created. This led to the purchase of the central portion of the peninsula by a New York Trading Company of the Mexican Republican chief, Juarez, in 1866. An exploring expedition, consisting of Mr. J. Ross Brown, Mr. W. M. Gabb, and Dr. Ferdinand Lochr, was organised in 1867, and we now know from their report much more of the peninsula.†

They state that the inhabitants are not more than 6,000 in number, chiefly half-castes, in whom Indian blood predominates, but they are now estimated at from 25,000 to 30,000, including about 4,000 Indians, and this is the entire population of an area about 680 miles (nautic) long by 23 to 120 miles in breadth. The land of the peninsula gradually slopes, or forms a succession of plateaux, from the shores of the Pacific to within a few miles of the eastern coast, where it terminates in abrupt precipices, from 3,000 to 4,000 feet in height, facing the Gulf of California. This singular conformation suggests the idea that the peninsula forms only one-half of a mountain range, divided longitudinally, of which the corresponding or eastern half has disappeared along the depression of the gulf. The narrow tract between the foot of the high escarpment and the gulf shores is broken into ridges and valleys, forming a sort of undercliff, and clothed with a luxuriant semi-tropical vegetation.

The rocks of this long mountain range are of modern geological date, or the tertiary period, but the southern and northern portions are differently constituted. Here the slope and escarpment are replaced by a chain of granitic mountains. In the South, the peak of St. Lazaro rises to a height of 6,000 ft., being the highest point. Most of the central part is bare of trees. One half

* The most valuable pearls in the possession of the court of Spain were found in the gulf in 1615 and 1665, in the expeditions of Juan Yturbi and Bernal de Pinadoro. During the stay of the Visitador Galvez in California, in 1768 and 1769, a private soldier in the *presidio* of Loreto, *Juan Ocio*, was made rich in a short time by pearl fishing on the coast of Cerralvo. Since that period the numbers of pearls of California brought annually to market were almost reduced to nothing. The Indians and negroes who followed the severe occupation of divers have been frequently drowned, and often devoured by sharks. The divers have always been poorly paid by the whites.—*Alcedo*, 1768—69.

† Official Report on the Mineral Resources of the United States, by Mr. Ross Brown, 1868, page 630. The work contains much valuable geographical information.

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the population is concentrated in the picturesque valleys of the granite range in the South, where the flourishing silver mines of Triunfo are situated. There are here three or four small towns, but in the rest of the territory only small scattered villages and mission stations are to be met with.

There are some tolerable harbours, but, from the foregoing reasons, they are ineligible for the site of large towns. It is said to be rich in minerals, and near its South extremity there are said to be some rich argentiferous lead mines, but these and others have been comparatively little worked. Timber, and indeed vegetation itself, is very scarce, by far the largest portion of the surface being incapable of producing a single blade of corn. In some of the sheltered valleys fruits suitable to a warm climate have been successfully cultivated, and wine has been made and exported. Cattle are rather more numerous than would have been supposed, as they feed on the leaves of the musquito tree, a species of acacia. Some observations on the climate of the gulf are given presently; but for the land it may be said to be excessively hot and dry. Unlike Mexico, the rains, except in the most southerly parts of the peninsula, occur during the winter months; summer rains scarcely occur North of Loreto. Near lat. 26° violent earthquakes are not uncommon.

In the subsequent descriptions the works of Capt. Sir Edward Belcher, of H.M.S. *Blossom*, who surveyed several of its ports; that of Du Petit Thouars; of M. Duflet de Mofras; the voyage of Capt. George Vancouver, in 1793; and the interesting volumes by Dr. Wm. Bell, 1869, &c., have been consulted, together with the reports of the United States surveyors.

The GULF OF CALIFORNIA may be considered to terminate on the South at Mazatlan and Cape St. Lucas. It was designated by the first Spanish navigators under the name of the Red or Vermilion Sea (*Mar Rojo*, *Mar Vermejo*), on account of the colour of its waters, and from its resemblance to the Red Sea of Arabia. The learned Jesuit missionaries traversed it entirely, calling it *Seno* or *Mar Lauretano*, Gulf or Sea of Loreto, in honour of the Virgin, their protector and patroness, and it has been called the *Sea of Cortes*, from the great general.

The length of the gulf is about 600 miles; its greatest breadth is 180 miles at its entrance; but throughout its extent the distance from one side to the other varies from 50 to 120 miles. Beyond the thirty-first parallel, its breadth rapidly diminishes to the Rio Colorado, which falls into it at its head.*

* At a few miles inland from the northern head of the gulf commences a remarkable depressed area, a dry and sandy desert, 200 miles in length by 50 miles in width, lying on the western border of Arizona, its central part being stated to be 350 ft. below the sea-level. It is proposed to connect this with the gulf by a canal, and thus make an inland sea, for the purpose of improving the climate of the surrounding barren country.—*Proceedings of the Royal Geographical Society*, November, 1879, p. 720.

It has been often remarked, that a singular phenomenon occurs here, which science does not explain, and of which we possess but few examples. It is that of rain falling when the atmosphere is quite clear, and the sky perfectly serene. The savant Humboldt and Capt. Beechey have related the fact; the first having testified as to its occurring inland, the second in the open sea.

Independently of a great number of fish, of a variety of species, there are two species of immense shark found in the gulf (*el tiburon* and *la tintorera*), which often seize the pearl fishers. Whales were also met with in considerable numbers. On the islands are numerous seals and sea-calves. The pearl fishery is, or rather was, also followed, as stated in the introductory remarks.

The two shores of the Vermilion Sea run parallel with each other toward the N.W.; they are generally very low and full of salt marshes, tenanted by alligators, reptiles, and insects. The general aspect of the country is horrible; the imagination cannot conceive anything more naked, or desolate. There is an entire want of water and vegetation; there are only mangroves, and some thorny plants, such as the *cactus*, magueys (aloes), or acacias, to be seen. Orange trees or palms are rarely met with, and one must proceed some leagues into the country to find vegetable mould. The shore is formed by sand and lands quite unfit for cultivation.

At the entrance of the gulf, on the eastern side, the summits of the *Sierra Madre* may be seen in the distance; these separate the states of Jalisco, Sinaloa, and Sonora, and those of Nuevo Mexico, Chihuahua, and Durango. The coast of Lower California presents, without interruption, a series of rugged peaks of volcanic origin, and without any vegetation. This mountain chain, which comes down from the North, and extends throughout the whole peninsula, gradually decreases in elevation as it approaches Cape San Lucas.

The eastern side of the gulf is comprised in the Mexican States of Sinaloa and Sonora. Their principal riches consist in their gold and silver mines, and they have some considerable cities. The chief are in Sinaloa, Culiacan being the residence of the governor, &c. Rosario, above Mazatlan, has, or had, the quarters of the troops. Up to 1839 Arispe was the capital of Sonora, in which year it was carried 120 miles to the South, to the ancient mission of S. José de los Ures, on account of the incursions of the Apache Indians. The port of Guaymas concentrates all the maritime affairs of Sonora, and Hermosillo, the present capital, with about 25,000 inhabitants, is the centre of its commerce and riches.

Mr. Jeffery, R.N., who was here in January, 1834, makes the following observations in his journal:—"In the Gulf of California two winds are prevalent during the year. The N.W. from October until May, and the S.E. from May until October. During the former wind fresh breezes and fine weather will prevail, and a vessel making a passage up the gulf should keep the western shore on board, and she will find a little current in her favour, while on the

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eastern shore it will be against her. When the latter wind prevails you get nothing but heavy rains, oppressive heat, and sultry weather, and the reverse must be observed with respect to the currents.

N.B.—The above is a copy from an old Spanish manuscript, and we proved it correct when we made the passage in 1834."

During the rainy season, or from May to November, S.E. gales may be expected at any time below Guaymas, and occasionally a local hurricane or cyclone, known as *El Cordonazo*, blows with great violence. This latter is generally toward the end of the rainy season. Toward the head of the gulf, during December, January, and February, moderate gales from the N.W. are frequently experienced.—*Comm. G. Dewey, U.S.N.*

The Tides are felt throughout the gulf; their height varies with the direction and force of the wind, and the configuration of the coasts: thus it is 7 feet at Mazatlan, the road of which is open, and at Guaymas, the port of which is full of islets, and sheltered from the wind, it does not exceed $5\frac{1}{2}$ ft. In the upper part of the gulf the tides are regular, increasing in strength until the mouth of the Colorado River is reached.

The Currents depend in a great measure upon the prevailing winds; between Guaymas and San Blas they are strong and irregular in the rainy season.

The COAST between Mazatlan and Guaymas is but little known or frequented; it is low and dangerous, with numerous lagoons behind it, and should be approached with the greatest caution. During the rainy season the currents are strong and variable, particularly off the mouths of the small rivers and esteros. The interior country is an important mining district, which has been worked from the earliest times, and still affords, with due prudence and skill, an almost inexhaustible supply of silver, copper, and gold. The latter is thought to be too capricious to be profitable, and many of the copper and silver mines have brought ruin on their proprietors through extravagance and mismanagement. Another article of export is dye-wood, which is shipped from the river entrances.

About $5\frac{1}{2}$ miles to the northward of Creston Island is Pajaros Island, previously described, and at $2\frac{1}{2}$ miles farther to the N.W. is *Camaron Point*, a rocky bluff 50 ft. high, with a red hill, 403 ft. high, 2 miles to the eastward. From hence the coast trends N.W. $\frac{1}{2}$ W., $26\frac{1}{2}$ miles, to *Punta Piastla*, a rocky headland 156 ft. high, with a reef extending southward and westward of it. Midway between the points is *Grueza Point*, a rocky bluff, surmounted by a hill 77 ft. high, and at 9 miles N.E. of Grueza Point is a double peak, 2,121 ft. high, with a solitary table-peak, 1,220 ft. high, at 5 miles westward of it. About $3\frac{1}{2}$ miles south-eastward of Piastla Point a breaking shoal extends nearly half a mile off shore.

Piastla River, 3 miles northward of Piastla Point, is a mere creek in the dry season; vessels coming here for dye-wood anchor in 5 or 6 fathoms, about a mile from the beach, and abreast of a pier and some huts, a short distance east-

ward of the northernmost headland of Piastla Point, at a quarter of a mile northward of which is a white islet, 35 ft. high. Water and cattle may be obtained here. The village of Piastla is about 20 miles up the river. At 9 miles farther N.W. is the *River Elota*, nearly dry in the hot season, but a turbid torrent in the wet one. About 30 miles up the river is the village of *Elota*, standing in a thinly populated and partially cultivated country, of no interest to commerce. The village is near the foot of the Sierra Madre range of mountains, which runs generally parallel with the coast.

At 34 miles N.W. by W. $\frac{1}{2}$ W. from the River Elota is the *Rio San Lorenzo*, or *Boca Tavala*, only navigable in the dry season for coasters drawing 5 feet. Vessels come here for dye-wood. From 15 to 20 miles inland, between these rivers, is the *Sierra de San Sebastian*, 1,000 to 4,500 ft. high. Vessels coming to the Boca Tavala for dye-wood anchor in 6 or 7 fathoms, 2 miles from the beach, with Chuchamone Peak, 4,945 ft. high, and 28 $\frac{1}{2}$ miles distant, bearing E.N.E.

About 15 miles above the Boca Tavala is *Quila* village, and at about 45 miles from its mouth, and the same distance from the mouth of the Elota (on a branch of which it is situated), is the pueblo of *Cosala*, a well known mining place of about 5,000 inhabitants, with many gold and silver amalgamation works. Large numbers of cattle are reared, and the climate, though very hot, is considered to be healthy.

River Culiacan.—Between the Boca Tavala and the entrance of Altata Estero, a distance of 39 miles to N.W. by W. $\frac{1}{2}$ W., the low land extends many miles inland. Heavy breakers extend nearly 3 miles seaward of the entrance to the estero, the depth on the bar varying between 2 $\frac{1}{2}$ and 4 $\frac{1}{2}$ fathoms. The anchorage is in 6 fathoms, 3 $\frac{1}{2}$ miles off the entrance, with the saddle of Eldorado, 2,621 ft. high, in range with the distant Double Peak, 6,397 ft. high, bearing N. 43° E., which, in 1873, was also the range for entering the estero with 2 $\frac{1}{2}$ fathoms on the bar at low water. Small vessels find excellent sheltered anchorage off the village of Altata, 3 $\frac{1}{2}$ miles within the mouth of the estero.

Vessels of 50 to 100 tons can enter when there is sufficient wind to stem the tide, which occasionally runs at 4 to 5 knots, the ebb carrying discoloured water several miles to sea.

In 1882 this port was surveyed by the officers of the U.S.S. *Ranger*, who made the observation spot near the railway station to be in lat. 24° 37' 45" N., long 107° 56' 7" W. At 11 cables N.E. by E. from the anchorage is the outer buoy, from which the buoy just outside the breakers of the bar bears W. $\frac{1}{2}$ N., 1 $\frac{1}{2}$ mile, with two other buoys between. The boat channel, with 2 to 3 fathoms water, lies in the direction of N. by E. $\frac{1}{2}$ E. from the outer buoy. It has been proposed to run out jetties to improve the bar, and also to show a light on the North side of the entrance, nearly a mile eastward of the tripod, 40 ft. high.

The river is used to float down the large quantities of Lima or Nicaragua wood cut from all parts of the mountains in this vicinity. *Culiacan*, the capital of the province of Sinaloa, is 36 miles from its mouth; it has been a

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handsome Spanish town, and still contains some wealthy inhabitants, occupied with the numberless silver mines in the adjoining Sierra. The largest building is the Casa de Moneda, a mint, built by English engineers. The population amounts to about 10,000.

ALTATA is the port of Culiacan, and lies on the North side of the entrance of the river; it is only a small village, but large quantities of dye-wood, with silver, hides, and corn, are shipped from here. There is a railway and a good road from Altata to Culiacan; provisions can be obtained at the latter place, but water is scarce. The river is reported to be navigable for 10 or 12 miles above Altata.

It is high water, on full and change, at 11^h 30^m; springs rise 4 to 6 feet.

The following directions are by Capt. G. H. E. Horn, of the Hamburg barque *Colima*, 1860. "On leaving Manzanillo in the rainy season, a passage to Altata is very easily made, carrying a fair wind all the way; but in the dry season when the N.W. wind is blowing, much difficulty is then found, as strong winds and currents are against you at that time. It is advisable to hug the Mexican coast, in order to anchor, in case it should fall calm, as it generally does at night; by standing out of anchoring ground you will drift back in the calm, nearly as much as you have gained by beating up. On the passage you will sight the Cerro of St. Sebastian, the position of which on the charts from the Spanish survey, may be depended on. Having approached about lat. 24° 39' or 24° 40' N., long. 108° 10' W., the saddle-shaped hill of Tamasula will bear N.N.E. $\frac{1}{2}$ E., you are then W. by S. from the anchorage, distant 7 miles. Steer E. by N., and anchor as soon as you are in 8 fathoms water, muddy bottom.

"On steering for the anchorage of Altata, if the lat. of 24° 35' N. be passed, take care not to near the shore too much, as there are reefs stretching out several miles to the southward. It is by no means safe to anchor too near the shore. In case it should come on to blow, you have to slip your anchor and stand out to sea until the weather moderates.

"The filling and procuring water at Altata is difficult and expensive; it cannot be done with the ship's boats and crew, but you have to employ men from shore, who fetch it in small kegs on mules from a plain inland where it is dug for. Thirty hogsheads cost me while I was there 20 dollars, and 30 dollars more for bringing on board."

Aqua Pepa, the western spur of the Culiacan Mountains, is saddle-shaped, and about 20 miles westward of the saddle of Eldorado. On bearings from E.N.E. to North Aqua Pepa and Double Peak appear similar in form. The best time for standing in is about 2 hours before high water, so as to pass the bar at high water, and reach Altata about slack water. The force of the current, during spring tides, is from 4 to 5 knots an hour.

The anchorage off Altata is to the right of the town, in from 5 to 9 fathoms. It is well to moor with at least 30 fathoms of chain. Vessels drawing over

20 ft. cannot readily go up to Altata. Ships frequently have to wait several days before being able to put to sea, as the land breeze is seldom strong enough to allow standing out against the flood tide, even with a moderate swell on the bar.

There are no regular pilots, but in answer to the pilot signal the masters of coasters belonging to the port will come off. They are familiar with the channels, but not with the handling of large vessels. The pilotage is $1\frac{1}{2}$ dollar per foot and 3 dollars for the boat. For the harbour-master 4 dollars, and for the bill of health 4 dollars are charged. There are two custom-house officials, one of whom is sent on board while the vessel is taking in cargo. No cargo from a foreign port is allowed to enter.—*Annalen der Hydrographie*, 1881. (See *Nautical Magazine*, September, 1881).

From the entrance of Altata Estero the coast trends 39 miles N.W. to the Boca Playa Colorada, and is very low and dangerous, as shoals extend a long distance off, particularly off *Tule Estero*, 10 miles N.W. of Altata, and as far to the N.W. as Altamuna Point, 9 miles beyond the Boca Tule, where $4\frac{1}{2}$ fathoms is found at 3 miles from the land. Capt. S. Richmond, 1854, states that there is said to be a narrow channel close inshore, used by coasting and also by other vessels, especially contrabandistas.

The entrance to *Playa Colorada Estero* lies between two lines of breaking shoals. To enter pull in to within half a mile of the beach eastward of the entrance, and then pull parallel to the shore line, between the two lines of breakers, carrying from 9 to 12 ft. at low water. The village is 4 or 5 miles from the mouth of the estero; it has about 200 inhabitants, engaged in shipping large quantities of dye-wood. The anchorage outside is in 5 or 6 fathoms, about 4 miles off the entrance, and near the outer edge of the shoals. The bar lies northward of Saliacca Island, and is difficult; it has about 18 feet on it at high water, when coasters cross it. Within it is a wide bay, with 6 to 7 fathoms water, protected from all winds. The shore of the bay is an extensive mangrove swamp, with numerous esteros. Colorada lies up the largest estero, on a branch of which is El Manglon, another shipping place for dye-wood.

At 8 miles N.W. $\frac{1}{2}$ W. from the Boca Playa Colorada is the entrance to the *Rio de Sinaloa* or *Cinaloa*, useless for navigation. At about 40 miles up the river is Sinaloa, a Spanish town, now said to be decayed and almost desolate.

At 16 miles W. $\frac{3}{4}$ N. from the Rio Sinaloa is the *Boca Navachista*, the entrance of which is narrow and intricate, with 12 ft. on the bar at low water. It has become so shallow that the town of Navachista is fast becoming superseded by Playa Colorada. At 7 miles to the N.W. there is a remarkable white rock, 75 ft. high, in the lagoon. Water may be procured by sinking wells on *Vinorama Island*, a small sand island between Macapule and San Ignacio Islands, with several cotton farms on it. There is anchorage in 6 fathoms, between 2 and 3 miles from the shore.

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The road from Navachista to the mining districts of Chihuahua is described by Mr. Sevin as being over undulating ground, and fit for waggons or carts, goods being conveyed a distance of 60 travelling leagues for three dollars per cargo of 300 lbs.

Topolobampo Harbour, 22½ miles W. by N. ½ N. from the Boca Navachista, has a very narrow and intricate channel between the breakers; in 1874 the depth on the bar was 2½ to 3 fathoms at low water, but the shoals are constantly shifting. Inside the shoals there is excellent sheltered anchorage in 7 or 8 fathoms, and from thence a channel leads away to the large inland bay of *San Carlos*. The Farallon of San Ignacio, and the high lands of Topolobampo and San Ignacio, are excellent landmarks for making the anchorage off the mouth of the harbour.

Between the entrance of Topolobampo Harbour and *San Ignacio Point*, 11½ miles to W. ½ N., is the open *Bay of San Ignacio*, with good anchorage in N.W. winds, but quite exposed to southerly ones. A very dangerous shoal extends 3 or 4 miles westward and 1 mile southward of San Ignacio Point.

San Ignacio Island, in lat. 25° 26' N., long. 109° 24' W., is a small barren rock, 465 ft. high, called a Farallon by the Spaniards, entirely uninhabited, and only resorted to by seals and sea-birds. It lies 10 miles S. by E. from San Ignacio Point, and is a good landmark for those passing up or down the gulf.

Rio del Fuerte, or *Santa Maria de Ahome*, is of more importance than many hereabout, and debouches at 19½ miles northward of Point San Ignacio. A considerable body of water comes down it in the rainy season, and by it are floated in rafts and flat boats large quantities of the Lima or Brazil dye-wood. Shoal water extends a long distance off its mouth.

The village of Ahome lies about 10 miles up the river, and is connected by road with *El Fuerte*, a town at 70 miles up the river, which has declined, though it is near an important mining region. An Indian town, *Arboleta*, stands on the South side of the entrance.

At 11½ miles N. by E. from Fuerte River entrance is the mouth of the small *River Alamos*, only navigable for the smallest coasters. At 5 miles southward of the latter is *Alligator Hill*, 406 ft. high, serving, with Mount Alamos, as an excellent landmark for finding Agiabampo. The boundary between the states of Sinaloa and Sonora is close eastward of the River Alamos.

Agiabampo Estero, 12½ miles N. by E. from the River Alamos, has a narrow and intricate entrance, with 12 ft. on the bar at low water, in 1874, but it is liable to alterations. On the South side of the entrance is a sand-hill, 75 ft. high, with a wooden cross on it. To enter steer for the cross or hill bearing E. ½ N. until inside the northern shoal, when haul up and run parallel with the shore. There is anchorage in 7 or 8 fathoms, with the cross bearing E. ½ S. The town of Agiabampo is 10 miles within the entrance; dye-wood, silver ore, and treasure are shipped from here. Roads connect the town with Alamos and Fuerte, 40 and 45 miles distant respectively.

At 25 miles N.E. of Agiabampo Estero is the entrance of the *Rio del Mayo*, fronted by a bar, leaving a narrow 2-fathoms channel on its eastern side in the dry season. The country in this vicinity is fertile and thickly populated. The Indian village of *Santa Cruz* lies 8 miles up the river. *Mount Alamos*, 32 miles N.E. of the entrance, is 5,877 ft. high, and an excellent landmark.

Punta Rosa, at 9 miles W. by S. $\frac{1}{2}$ S. from the Mayo, is a low reddish point, about a mile eastward of which is an excellent anchorage in N.W. winds, but open to the S.E., in *Santa Barbara Bay*. The best is in 6 or 7 fathoms, three-quarters of a mile from the shore, with the ruins of an Indian house bearing N.N.W. There is a road from here to Alamos, 32 miles distant. Provisions were plentiful here.

At 12 $\frac{1}{2}$ miles W.N.W. of Punta Rosa is *Arboleda Point*, a few miles inland of which is a remarkable clump of trees, an excellent landmark. To the N.W. by N. of Arboleda Point the coast is formed by *Ciaris Island*, about 12 miles long, and separated from the main land by a narrow lagoon. From the N.W. end of Ciaris Island the coast extends 42 $\frac{1}{2}$ miles W. by N. $\frac{1}{2}$ N. to Lobos Point, and is low, sandy, and covered with bushes, with shoal water extending 1 to 2 miles off the mouths of the lagoons.

Lobos Point, in lat. 27° 20 $\frac{1}{2}$ ' N., long. 110° 38 $\frac{1}{2}$ ' W., is very low and dangerous, from the shoal water extending northward and westward of it, and requires great caution when approaching Guaymas, as the south-easterly current out of the gulf sets past it with great strength. *Lobos Island*, of which Lobos Point is the S.W. extremity, is low and sandy, separated from the main land by the narrow Estero de la Luna. It is 4 $\frac{1}{2}$ miles long, its highest point being *Monte Verde*, a remarkable green mound, 75 ft. high, about 1 $\frac{1}{2}$ mile within Lobos Point; there is a solitary palm tree between the hill and the point, by which the coasters recognize the locality.

At 30 $\frac{3}{4}$ miles N. $\frac{3}{4}$ W. of Lobos Point is *Cerro Yacicoris*, a conical hill 450 ft. high, numerous lagoons lying along the coast. Midway between is the mouth of the new *Yaqui River*, filled with shoals, and only navigable for the smallest coasters in the dry season. The old Yaqui River debouches to the eastward of the Cerro Yacicoris, and its banks are inhabited by some Indians of the Yaqui tribe.* The waters of the river are much used for irrigation, and excellent oysters are found in the entrance, and are carried to Guaymas.

From Cerro Yacicoris the smooth sand-beach, named El Cochori, extends 12 $\frac{3}{4}$ miles westward to Morro Inglese at the entrance of Guaymas Harbour.

* This river may become of some importance hereafter, for Dr. William A. Bell states, 1869, that there are extensive coal fields on both sides of the Upper Yaqui River, of a quality equal in every respect to the finest coal of Newcastle or Pennsylvania. The nearest coal to Guaymas is found at San Marcial, 60 miles distant; although this important fact will have great weight with the future of Sonora, the mines are at too great a distance from the shore to be available now.

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About 20 miles inland, eastward of Cerro Yacioris, is the *Sierra Yaqui*, the highest peak of which, Mount Bacatele, is 3,342 ft. high. To the eastward of the Sierra Yaqui is the smaller range of *Baroyeca*.

GUAYMAS is the principal harbour of the Mexican state of Sonora, but it has hitherto been of much less importance than Mazatlan, because the back country at the latter is well peopled, whereas northern Sonora is almost uninhabited. It now appears probable that it will much increase in importance, a branch line connecting it with the Southern Pacific Railway, between New Orleans and San Francisco, completed in May, 1883. The railway passes to the northward through Hermosillo, the capital of Sonora, to Nogales on the United States frontier, where it joins the American line.

The entrance to the harbour is two-thirds of a mile wide between Morro Ingles on the East and Point Baja on the West, and is guarded by a long rocky island called *Pajaros*, 212 ft. high, lying exactly in front and outside of it, which makes the harbour doubly secure. The North end of this island is connected with the shore by a shallow flat of 15 ft., the channel thus passing between the West side of *Pajaros* and Trinidad or San Vicente Island. The harbour, though small, is well sheltered, and vessels can anchor according to their draught of water; vessels of light draught can approach the mole. According to the observations of the American surveyors, the observation spot, on the East side of *Almagre Chicho* or *Almagrito* Island, is in lat. $27^{\circ} 54' 35''$ N., long. $110^{\circ} 54' 13''$ W.

The population now numbers about 5,000. Excellent flour, fresh bread, and beef may be obtained at moderate prices; no salt provisions or ships' stores could be purchased. Fresh water and wood are indifferent and expensive. The mail steamers call here, the Colorado River Steam Navigation Company having a small coal depôt here.

Dr. Bell says that the true harbour of Guaymas covers an area of a little less than 4 square miles, in which three small islands, the rocky peaks of submarine hills, rise perpendicularly from a depth of from 3 to 4 fathoms, and form a little inner harbour. From the bare volcanic mountains which enclose the harbour several irregular little promontories project into the water, and occupy much valuable space. The total area, in fact, of water more than 4 fathoms in depth, does not exceed half a square mile.

It is thus described by Lieut. Derby in December, 1851:—The harbour of Guaymas is one of the best upon the coast; it is perfectly landlocked and protected by its numerous islands from every quarter. It has been so often and so well surveyed, that it is unnecessary for me to enter into a minute description of its merits. It is to be regretted, however, that it has not more water, from 4 to 5 fathoms being the average depth, which is insufficient for a ship of the line, or even a first-class frigate. We found Guaymas a dirty place, with a dirty population of about 1,500 or 2,000. The houses being

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built of *adobe*, with the roofs sloping towards the interior, have a very unfinished appearance, and from the harbour the town presents the appearance of having been abandoned when half built. There are two small piers in a ruined condition; and near the landing a large pile of earth, surmounted by two or three crumbling walls, over which floats from a lofty staff the flag of Mexico, marks the site of the *adobe* fort, knocked down by the guns of the *Dale* during the late war. There are several wealthy individuals in Guaymas, who monopolize the whole of the business with the interior of Sonora, but the mass of the population are in a state of wretched poverty. The water at Guaymas is obtained from wells, and is slightly brackish. Excellent oysters are brought from the River Yaqui, which empties into the bay about 20 miles South of the town, and sold to the shipping at a dollar a bushel; the Mexicans, however, make no use of them.

The time of high water at full and change of the moon at Guaymas is not very accurately determined; it is, however, between 8 and 9 a.m. The ordinary rise of spring tides is 6 ft., neap tides 4 ft. The phenomenon of four tides in twenty-four hours has repeatedly occurred here, as I am credibly informed. The prevailing winds in May, June, and July, are from the S.E. and S.W. The thermometer during the summer months ranges from 92° to 98° Fahrenheit, the maximum 110°; during winter from 56° to 60°, minimum 45°. —*Capt. Wilcox*, 1850.

Capt. Henry Trollope, R.N., gives the following directions:—Guaymas once having been seen cannot, with ordinary attention, be mistaken; the whole coast is so remarkable that one is only at a loss to say which is the most prominent landmark; nevertheless, as Pajaros Island lies right before the entrance when 10 or 12 miles to the eastward, it is a blind harbour; a stranger without a chart might well be in doubt as to the entrance. Cape Haro, a bold, bluff headland, jutting out due South to seaward, and rising with a wall-like cliff 200 ft. from the water, is the best mark for the harbour; it has 14 or 15 fathoms touching the rocks, and the entrance between Trinidad (an island so called from the distinct manner in which it is formed in three divisions united at their base) and Pajaros is clear and free from danger, only taking care to give the points, particularly Punta Baja, a berth of half a cable's length; the lead is quite sufficient guide for going in. Secondly, the white smooth beach of Cochore, extending uninterruptedly from the Morro Inglese at the entrance of the harbour, 12 miles to the eastward, and terminated suddenly by a still more remarkable hill, called Cerro Tordillo, or, as we termed it, Morro Afulva, lies in such contradistinction to the extraordinary mass of hills forming the peninsula, out of which the harbour of Guaymas is hollowed like the crater of a volcano, that it is from the contrast almost equally remarkable.

Further to the northward are the remarkable peaks called Tetas de Cabra (Goat's Teats). Some have recommended these to be made, as the prevalent wind is from N.W., and there is certainly no advantage to be gained by getting

* This will demonstrate the danger of the wind, for we are to be most be guarded against it.

over on the Cochore shore, while by making the land to the windward of Cape Haro a ship will have the prevalent breeze and current in her favour. The Tetras de Cabra are about $12\frac{1}{2}$ miles W.N.W. of Cape Haro; they stand on the West shore of a large deep bay (San Francisco), which has several patches of rocks and islets in it. Pajaros Isle forms of itself an excellent harbour; in fact, the space between Trinidad (San Vicente), Pajaros, and Morro Inglese is equal as far as security, and superior as to depth of water, to the harbour itself; the advantage the latter has, is in there being a better access into the interior. The tides are very irregular, except at full and change; there appears to be only one tide in the twelve hours, but then the usual interval occurs between high and low water. The greatest rise and fall we observed during our stay was 4 ft. High water 8^h a.m.

M. Duffot de Mofras says the harbour of Guaymas is recognised from the offing by a mountain surmounted by two peaks, which are called Las Tetras de Cabra, from their supposed resemblance to the tents of a goat. When this is made out, run along the coast, leaving it a little to port, and the island of Pajaros, which forms the East side of the entrance, will soon be seen. Then steer so as to leave it to starboard, entering the channel between it and the land, and the town and harbour will soon be discovered. The entrance of the harbour once doubled, two islands are seen in the inner part of the bay, and you pass between these to reach the anchorage, near or off the land, according to the draught of water. Vessels under 100 tons make fast to the landing-place, and those drawing 12 to 15 ft. anchor a quarter of a mile off, in 3 or 4 fathoms. Large ships ought to cast anchor outside these islands in 6 or 7 fathoms. This harbour, which would hold a considerable number of vessels, is very safe in all seasons; the bottom is good holding ground, and it is sheltered from all winds, and forms a large basin, surrounded with islands, which prevent any heavy swell reaching it. The bank lying in front of the entrance is the only danger to shipping, but it is easily avoided in leading winds, by keeping along the land. Should a vessel be obliged to beat in, she should be careful not to touch this bank.

Guaymas is surrounded by high mountains, which make it extremely hot in the rainy season. The same fevers are prevalent here as at San Blas and Mazatlan.

The following remarks on Guaymas are by Lieut.-Com. S. O. Woolridge, H.M.S. *Spy* :—"I arrived at Guaymas on July 21st, 1847, in four days from Mazatlan. During this passage we experienced *strong currents running to the N.W.*,* from a mile to a mile and a half an hour. They were much influenced by the wind, which, from the 19th to the 21st, was south-easterly and

* This will demonstrate that these currents are greatly, if not entirely, dependent on the wind, for we are told by other commanders that there is a *great outset* from the gulf, which must be guarded against in crossing the entrance.

southerly. The current also runs with more force on the eastern shore, which side we kept.

"Cape Haro can be easily distinguished by the Tetras or Paps, which resemble the teats of a goat; they are to the northward. The island of St. Pedro Nolasco is just visible from the deck to the N.W. The land on the Yaqui shore is high and peaked; keeping this broad on your starboard bow, steer to the northward of a deep bay, where the land breaks off, and you will soon perceive the island of Pajaros, which is at the entrance, or facing Guaymas. The water is deep all along the island of Pajaros; that is to say, 4 fathoms, so close as to throw a biscuit on shore.

"A large ship will have to anchor soon after passing Pajaros; that is, abreast the Morro, in 5 fathoms. A small ship can anchor just inside the isles of Ardilla and Almagro, in 4 and $3\frac{1}{2}$ fathoms; and in 3 fathoms, as far in as the point off the town. You may go close to either of the Isles Ardilla or Almagro, in 3 and $3\frac{1}{2}$ fathoms.

"Water is very difficult to be got; it is to be obtained by sending about 4 miles for it, or it can be purchased; but, owing to its having to be brought in on mules or in carts, the price is very high. I wanted 12 tons, which I found could not be obtained for less than 30 dollars, which would be nearly 10s. a ton."*

Of the shores of the gulf northward of Guaymas, our knowledge was very imperfect till the survey by the U.S. officers in 1873-5, &c.† Previous to this the chief authorities were the old Spanish charts, and the exploration made in the U.S. transport *Invincible*, Capt. Wilcox, 1850, as related by Lieut. George H. Derby.

At $3\frac{1}{2}$ miles W. by N. $\frac{1}{2}$ N. from Cape Haro is *Cape Arco*, 970 ft. high, $2\frac{1}{2}$ miles N.W. $\frac{3}{4}$ N. of which is *Punta Colorado*, the coast being high and barren. At 5 miles westward of Punta Colorado is *Punta Doble*, the *Ensenada de San Francisco* lying between, with several islets in it, 10 to 50 ft. high. On the North side of Punta Colorado is the anchorage of *Bacochibampo*,

* *Hermosillo*, which is the chief town of the state of Sonora, is 84 miles by the road North of Guaymas, which may be considered as its port, and with which it is now connected by railway. But the trade of each was not considerable, for Dr. Bell says that three merchant vessels in 1867 glutted the markets of both places. *Hermosillo* is a most curious and interesting old town, resembling what a large Moorish town in Spain was in the 17th century. Its situation is singular; it is built in the gap which the Rio Sonora has cut through the western range, and which rises high all around it. It is the focus of an important silver mining region, and possesses a mint for coining dollars. Its inhabitants number about 25,000.

† In 1880 the United States Hydrographic Office published "Sailing Directions for the West Coast of Mexico between the U.S. boundary and Cape Corrientes, including the Gulf of California," as derived from these surveys. Much of the information there given has been incorporated in this work.

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sheltered from the S.E., and here fresh water, beef, fruit, &c., may be procured. A hill, 1,450 ft. high, lies a mile northward of the anchorage. On the East side of Punta Doble is the entrance to the *Puerto de San Carlos*, or *Escondido*, a small landlocked port with 3 and 4 fathoms water in it, excellent anchorage for small vessels.

Point San Antonio, $2\frac{1}{2}$ miles westward of Punta Doble, may be known by the *Tetas de Cabra*, before described, which lie about a mile eastward of it. The *Algodones*, a group of small islands, lie 2 miles northward of the point, the outer *Venado Island*, 150 ft. high, being about a mile off shore. At $10\frac{1}{2}$ miles N.W. by W. $\frac{1}{2}$ W. from San Antonio Point is *San Pedro Point*, a bold rocky headland, 515 ft. high, with a small open bay southward of it, in which a ship may find shelter in N.W. winds.

San Pedro Nolasco Island, 8 miles S.W. $\frac{1}{2}$ S. from San Pedro Point, is a barren, almost inaccessible, volcanic rock, about 2 miles in length, parallel with the coast, and from 500 to 1,071 ft. in height. Landing might be effected at a place on its S.E. side.

Between San Pedro Point and *Morro Colorado*, a remarkable reddish headland, 560 ft. high, $16\frac{1}{2}$ miles to N.W. $\frac{1}{2}$ W., the coast is high and barren, affording no shelter or anchorage. At 6 miles S.E. $\frac{1}{2}$ E. from the latter is a white rock, 60 ft. high, at $1\frac{1}{2}$ mile from the shore; this and three others close inshore are called *Las Piedras Blancas*. At $4\frac{1}{2}$ miles northward of Morro Colorado is the small estero of *Tastiota*, at the bottom of which fresh water may be obtained. In good weather there is anchorage in 6 or 7 fathoms, half a mile off the entrance.

From hence the coast trends 14 miles W. $\frac{3}{4}$ N., and then 22 miles N.W. $\frac{1}{2}$ W. to *Kino Point*, a prominent point of moderate elevation. This coast, known as the *San Juan Bautista Flats*, is low and sandy, and bordered with shoals, which extend 4 miles off at 14 miles westward of the estero of Tastiota.

Between Kino Point and *Pelican Island*, a small island 540 ft. high lying close to the mainland, $2\frac{1}{2}$ miles to the N.N.W., is *Kino Bay*, which is open, but small vessels can find shelter in both N.W. and S.E. winds. La Cruz Lagoon lies at the bottom of it.

All this part of the province is barren, and only a few Tépacas Indians are to be met with. The rivers do not reach the coast at all times, for a large portion of their waters is diverted for irrigation.

TIBURON ISLAND, the S.E. end of which bears W.S.W. 16 miles from Pelican Island, is 29 miles long S. by E. and N. by W., and $19\frac{1}{2}$ miles wide, being the largest island in the gulf. It is high and rugged, its peaks varying from 1,000 to 4,000 ft. in height. It is separated from the mainland by a narrow and intricate channel, about 2 miles wide, named *El Infiernello* or *El Canal Peligroso*, the northern part of which is full of shoals. Tiburon has long been known as the abode of the Ceres Indians, a small tribe of about 500, who are represented as extremely hostile, and invariably

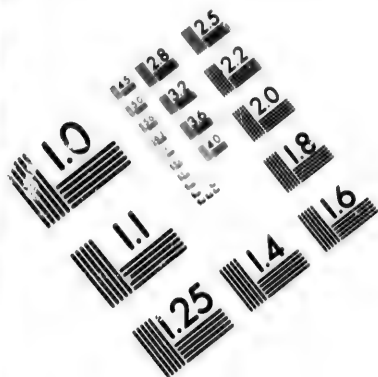
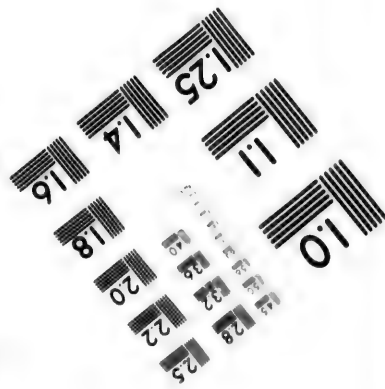
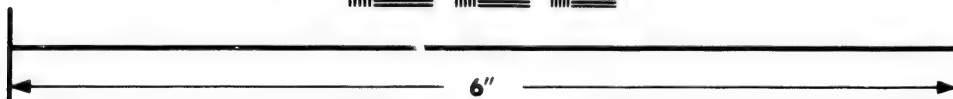
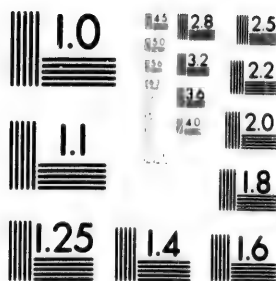


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opposing any attempt at landing; they are said to be armed with poisoned arrows. During the stay of the *Narragansett* they at first were shy, and made threatening gestures, but afterwards became very friendly. A rich bed of pearl oysters is said to exist between this island and the coast of Sonora, and there are accounts of rich gold mines upon the island; but as no one is ever known to have landed there, it is difficult to understand how the fact was ascertained. A species of large deer is found on the island in large numbers.

Between the North and N.W. extremes of Tiburon is *Fresh-water Bay*, affording anchorage in 5 to 7 fathoms, three-quarters of a mile from the shore, sheltered from south-easters, but open to the N.W. The eastern side of the island is generally low and sandy, but near the S.E. point the coast becomes steep, with rocky bluffs. On the North side of the peninsula, of which the S.E. point is the extremity, there is good anchorage in 5 or 6 fathoms, sheltered from the prevailing winds. It is said that fresh water may be obtained at an Indian settlement, $5\frac{1}{2}$ miles northward of the anchorage.

Monument Point, the southern point of Tiburon, is a rocky bluff, $3\frac{1}{2}$ miles S.W. by W. from the S.E. point, with a sandy beach between. About $1\frac{1}{2}$ mile south-eastward of it is *Turner Island*, a small barren island, about $1\frac{1}{2}$ mile long, and 550 ft. high, with a reef of rocks extending towards *Seal Rock*, 150 ft. high, between which and Monument Point is a clear channel a quarter of a mile wide, through which 5 fathoms may be carried. A dangerous rock, awash at high water, lies 6 cables S.W. by S. $\frac{1}{2}$ S. from the islet.

From Monument Point the coast trends about W. by N. $\frac{1}{2}$ N. $15\frac{1}{2}$ miles to Willard Point, and is a succession of rocky bluffs. Between Monument Point and Red Bluff Point, $2\frac{1}{2}$ miles to the westward, is a small bay, with good anchorage in 5 or 6 fathoms, a quarter of a mile from the sandy beach, sheltered from N.W. winds; the tide rises 6 to 8 ft. *Willard Point*, the S.W. extremity of Tiburon, is a bold cliff, over 300 ft. high; there is said to be tolerable anchorage in 7 fathoms, about $1\frac{1}{2}$ mile eastward of it, and close to the shore. A large white rock, 30 ft. high, lies $1\frac{1}{2}$ cable off shore, at $3\frac{1}{2}$ miles eastward of the point.

The western shore of Tiburon from Willard Point to the N.W. extremity, a distance of 21 miles, is mostly steep, with rocky bluffs. A number of rocks lie close off the N.W. extreme.

San Estevan or *Bruja Island*, $6\frac{1}{2}$ miles to the S.W. of Tiburon, presents an exceedingly wild and sterile appearance, resembling the generality of the gulf coast on the California side. The appearance of the water between this island and that of St. Lorenzo led us to suppose that we were on soundings, but on trying the deep-sea lead we found no bottom at 100 fathoms.—(*Derby*). It is about 4 miles long and 3 miles wide, and from 800 to 1,800 ft. high. There are two tolerable anchorages off its southern end, on either side of a low sand-spit.

San Pedro Martir Islet lies $22\frac{1}{2}$ miles S. $\frac{1}{2}$ E. from the South end of

Tiburon Island, rising to a height of 100 ft. The smallest being Tiburon are distant 10 miles.

Patos Island is a low and barren island, and low except at high tide. It is barren and is a tolerable anchorage, 1 mile from the shore.

At 8 miles from Tiburon is *Tepopa*, a bold point, low and narrow. West of the point is a bay, 5 fathoms, half a mile from the shore.

From Cape Tiburon, and sandy, back to the rocky headland of *Libertad Bay*.

Libertad Bay is a bay, 8 or 9 fathoms deep, and the tides rise 12 ft. At 23 miles N. from the northward, southward of the point.

Tepoca Bay is a bay, rocky, with a sandy beach, and a point, well sheltered, and neaps 12 ft. lies just to the northward of the anchorage.

San Ignacio is a small island, through the sand, may be procured, river the coast, consists of low sand, extends from the shore, raises clouds of sand.

George Island is a small island, named *George Bay*.

Tiburón Island. It is a barren triangular rock less than 2 miles in extent, rising to a height of 1,052 ft. Three small islets lie off its southern end, the smallest being half a mile distant. The other islands to the westward of Tiburón are described hereafter with the opposite coast.

Patos Island, $4\frac{1}{2}$ miles N. $\frac{3}{4}$ W. from the N.W. end of Tiburón Island, is small and low except on the N.W. side, where it rises in a conical hill 310 ft. high. It is barren and nearly white from the guano deposits. In N.W. winds there is a tolerable anchorage on its southern side, in 5 fathoms, sand, a quarter of a mile from the beach. Spring tides rise 10 ft., neaps 7 feet.

At 8 miles N.W. by N. $\frac{1}{4}$ N. from the northern end of Tiburón is *Cape Tepoca*, a bold headland 1,857 ft. high. At $6\frac{1}{2}$ miles south-eastward of it is *Sargent Point*, a barren rocky hill, 150 ft. high, at the South extremity of a low and narrow neck of land partially overflowed at high water springs; just West of the point is a small bight, where there is tolerable anchorage in 7 fathoms, half a mile from the shore.

From Cape Tepoca for 39 miles N.W. $\frac{1}{4}$ N. to Cape Lobos the shore is low and sandy, backed by a coast range 600 to 2,300 feet high. *Cape Lobos* is a rocky headland, 702 ft. high, with some sunken rocks off it.

Libertad Bay or anchorage, also called the *Puertecitos*, lies eastward of Cape Lobos, and is well protected from N.W. winds, but open to the S.E. Anchor in 8 or 9 fathoms, about half a mile from the head of the bay; here spring tides rise 12 ft., neaps about 9 ft. There is a road from here to the town of Altar, Libertad being a shipping port for agricultural and mineral products. At 23 miles N.W. by N. $\frac{1}{4}$ N. from Cape Lobos is *Cape Tepoca* or *Topoca*, 300 ft. high, and of a reddish colour, appearing as an island when first seen from the northward. There is a rocky headland, 1,642 ft. high, about 13 miles southward of the cape.

Tepoca Bay lies to the eastward of the cape; its western point is low and rocky, with a reef, covered at high water, extending a short distance southward of it. There is good anchorage, in 5 or 6 fathoms at low water, inside this point, well sheltered from N.W. winds; spring tides rise about 15 ft., and neaps 12 ft. A hill, 540 ft. high, of a dark red colour on a yellow bed, lies just to the northward of the cape, and is an excellent guide to this anchorage.

San Ignacio River, 18 miles N.W. $\frac{3}{4}$ N. from Cape Tepoca, only breaks through the sand-bar at its mouth during the rainy season, but fresh water may be procured at all times just behind the sand-hills. To the N.W. of the river the coast becomes lower, and as far as Shoal Point, 90 miles distant, consists of low sand-hills, with some low stunted bushes on them. Shoal water extends from the shore nearly all along this coast, and the wind perpetually raises clouds of the fine sand composing the shore.

George Island lies near the central part of a large indentation of the coast, named *George Bay*, 6 miles off shore, and $48\frac{1}{2}$ miles N.W. $\frac{3}{4}$ N. from Cape

Tepoca. It is merely a barren rock, 206 ft. high, with rocks extending over half a mile north-westward of it, some above water, and others awash at low water. In S.E. winds there is tolerable anchorage in $3\frac{1}{2}$ fathoms on the northern side of the island, off a small sand-beach covered at high water, which connects the island with the nearest rock. Guano is abundant here, and has been worked.

Rocky Point is a low black point, 20 miles N.W. by W. from George Island, and about 5 miles farther W. by N. is Rocky Bluff, 408 ft. high, a small open bay lying between them.

From Rocky Bluff the coast trends to the northward and westward for many miles, forming the open bay named *Adair*. This bay is nearly 30 miles deep, entirely open to the S.E., and filled with dangerous shoals. *Shoal Point*, on the eastern side of the entrance of the Colorado River, is low and sandy, and lies $45\frac{1}{2}$ miles W. by N. from Rocky Point.

About 9 miles W.N.W. from Shoal Point the beach projects slightly, and behind it are some sand cliffs at the foot of the hills. *Direction Sand-hill*, which lies behind this projecting beach, is 556 ft. high, and easily recognised by a growth of bushes at its foot. It is an excellent mark for entering the river.

Port Isabel.—A channel, with 2 to 5 fathoms at low water, leads from Shoal Point to the slough of Port Isabel, 24 miles to W.N.W., passing the mouth of Santa Clara River, marked by a beacon on its West side. The entrance of Port Isabel is also marked by beacons; the settlement is about $2\frac{1}{2}$ miles up, and serves as a repairing place for the river boats. The lead is the only guide, as the shoals are constantly shifting. At full and change the tide runs with great strength, sometimes at the rate of as much as 6 miles an hour.

It is high water at Shoal Point, on full and change, at about $0^h 30^m$; spring tides rise 25 to 30 ft., neaps 6 to 10 ft.

The head of the Gulf of California has evidently been formed by the detritus brought down by the singular but almost useless river, the Rio Colorado. There is no doubt that it is subject to very great changes,* and therefore no directions can be useful for any period.

* The head of the gulf probably was much farther northward in earlier ages of the world's history. For at from 80 to 160 miles N.N.W. from the present mouth of the Colorado is an area called the Salt Lake. This is shown by barometrical observations to be below the sea-level. It is now a dry plain of alluvial formation, with a beach line distinctly traceable. Mr. W. P. Blake, of Washington, explains its formation by inferring that the silt or matter brought down by the river has filled up the interval, and shut it off from the gulf. The water was then evaporated by the dry winds of that desert region; and again, the water of the Colorado, at the time of freshets, overflows and runs back into the desert for many miles. It has been proposed to inundate this area by means of a canal from the head of the gulf, as stated in the note on p. 129.

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The **RIO COLORADO** is the most important river of this region, and is one of the most singular in the world. It takes its rise in the Rocky Mountains, its length being estimated at 1,050 miles. The real character of its upper course has only been known within a recent period. It divides the State of California from the territory of Arizona; and at 70 miles in direct distance from its mouth is the junction of the *Gila River*, a most important stream which drains the rich mining districts of S.E. Arizona. On the South side of the junction is *Arizona City*, "a small place with a big name," and on the North side is *Fort Yuma*, the first station of the Colorado Steam Navigation Company; this company, with another, has several steamers and barges of 70 to 100 tons burthen. The condition of the river may be judged of when it is stated that these craft draw *one foot* when light, and *two feet* when loaded, and never travel by night. The main line of the Southern Pacific Railway passes by Fort Yuma. The river is navigable to *Calville*, in lat. $36^{\circ} 13' N.$, a distance of 612 miles by the river from its mouth, and 400 miles S.S.W. from Salt Lake City, with which it is connected by a good road. The summers here are intensely hot (rising to 126° in the shade), but the winters are mild, the lowest extreme being 34° . The average amount of rain in 4 years at Fort Yuma, between 1857—1861, was only 4.01 inches per annum. The principal exports from the river are hemp, and silver-lead and copper ores.

Above Calville the Colorado runs through that most wonderful natural phenomenon—the Grand Cañon, a gorge 300 miles long, evidently cut by the river through the strata to a depth of 3,000 to 6,000 ft., being scarcely broader at the level of the river than it is on the upper surface of the plain. It is this unexampled singularity which renders it quite useless to man, either for means of transport, or for fertilizing the country through which it flows.*

Lieut. Derby says of it (January, 1851):—

The bar at the mouth of the Colorado is about 10, possibly 15 miles in width; the soundings upon it are from 10 ft. to 4 fathoms; it is a very loose, muddy bottom, and with a stiff breeze a vessel could force her way over it, even if drawing a foot or more than the lead would indicate. The distance from the junction of the Gila and Colorado to the mouth of the latter, by water, is about 104 miles, owing to the many bends of the river, though the difference of latitude is but little more than half that distance.

Montague and *Gore Islands*, lying in the entrance, are to be readily recognized from Hardy's description. They are low, flat, and sandy, and are separated

* In Dr. Bell's "New Tracks in North America," 1869, an account is given of the passage down this gorge by James White, a miner. Fleeing from the Indians, his party (who were all lost but himself), in August, 1867, entered the canon on a raft, and after a frightful journey of fourteen days (of which six consecutively were without food), he reached Calville in a dreadful state. This thrilling narrative is found in Chapter XIII of the above work, and it is probably the only exploration that has been, or will be, made of this ravine.

rated by a very shallow channel a mile wide. The country here is covered with dwarf reed and coarse grass. Thousands of trunks of trees lie scattered over its surface as far as the eye can reach, showing that it must be entirely overflowed in the season of the freshets.

The navigation of the Gulf of California presents none of those difficulties which we had been led to anticipate. The wind we found invariably from the N.W., which, at this season of the year, is its prevailing direction; it is only during the months of June, July, and August, that the gales from the S.E. are prevalent; except in Whale Channel we noticed none of the strong currents so frequently mentioned as existing in the gulf.

It would be difficult to mistake the entrance to the river, it being in fact the head of the gulf, which gradually narrows from 40 to 3 miles when it is joined by the river, whose turbid stream discolours the gulf for many miles to the southward, in soundings of 12 and 14 fathoms. On the Sonora coast, however, exists an indentation some 15 or 20 miles in depth, called by Hardy Adair Bay; the shoals of this can be seen from the mast-head, a view from which would prevent one falling into the error which he did of supposing it a mouth of the Colorado. The angle at the junction of the slough and the main river is called Arnold Point, and from the mouth of the river (after crossing the bar) to this point, the channel varies in depth from 15 to 30 ft., at ordinary high tide, and may, as we have practically demonstrated, be ascended by a vessel having a draught of 8 or 9 ft., by taking advantage of the flood, which has a velocity of from 3 to 5 miles per hour. It is impossible to sail up, however, for although the river varies in width from 3 miles to 600 yards, the channel is narrow and the navigation elsewhere obstructed by the numerous sand-bars. The proper method, after passing Gore and Montague Islands through the western channel of the river, is that which we adopted, to drift with the flood tide, keeping close to the highest bank, sounding continually, and anchoring before the time of high water: in this way we progressed slowly, but steadily, making, perhaps, 4 or 5 miles per day, until we arrived at the point where we finally landed the stores, which I have named "Invincible Point."

The mouth of the Colorado has evidently greatly changed since Hardy's visit in 1826. The ebb tide was observed to run at $5\frac{1}{2}$ miles an hour, and the flood comes in with a "bore," a bank of water, 4 ft. high, extending clear across the river, and occurs daily till near neap tides, proving the assertion of Hardy, that "*there is no such thing as slack water in the River Colorado.*"

In January, 1851, the depth in the entrance of the Colorado was from $2\frac{1}{2}$ ft. to $1\frac{1}{2}$ fathom.

Above Arnold or Philip Point, on which is a black beacon, the river is very circuitous, the channel becomes narrow, and the water has less depth. According to the U.S. survey, the beacon on Philip Point is in lat. $31^{\circ} 46' 10''$ N., long. $114^{\circ} 43' 31''$ W.

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The time of high water, on full and change, at Philip Point, at the junction of the Colorado with the gulf, is about 2^h 15^m; spring tides rise from 25 to 30 feet, and neaps from 6 to 10 ft. The tidal motion ceases at about 40 miles from the mouth. Near the mouth there is no vegetation, but higher up the shores are thickly lined with cane, rushes, small willows, &c., and the interior country with a coarse sharp grass.

The Western Shore of the gulf, from *Sargents Point*, on the West side of the Colorado River entrance, trends 38 miles southward to *San Felipe Point*, and is low, with plains rising gradually towards the mountains. Mud flats and shoals extend from 1½ to 6 miles off it.

Consag Rock, or *Ship Rock*, 18½ miles N.E. by E. ¾ E. from San Felipe Point, is small, of a white colour from the guano, and 286 ft. high. At a distance it has the appearance of a ship with all sail set, and forms an excellent mark for shaping a course to the Colorado River entrance. It is probably the same as Hardy's *Clarence Island*. Several detached rocks lie from a quarter to half a mile westward of it. Heavy tide-rips occur hereabout.

San Felipe Point is a dark rocky headland, surmounted by a hill 940 feet high, and close South of it is the small bay of the same name, affording some shelter from N.W. winds. A depth of 3 fathoms is found at a mile off the low shore; the best anchorage is in 4 to 5 fathoms, mud, in the northern part of the bay, with the hill on the point bearing N.W. ¼ W., and a conspicuous sharp white peak, 4,288 ft. high, S.W. ¼ W. Spring tides rise about 20 ft. It is stated that fresh water can be obtained here, and game is abundant.

At 28½ miles W. by S. ¾ S. from San Felipe Point is the mountain named *Calamahue*, or *Santa Catalina*, from the old mission at its foot; it is the highest mountain in Lower California, being 10,126 ft. high, and is visible over 100 miles off, having a whitish appearance with a jagged summit. Gold is reported to exist in this region.

Diggs Point lies 13 miles S.E. from San Felipe Point, and at 27 miles farther to S. by E. ¼ E. is *San Fermin Point*, the shore being low and sandy, with hills rising to about 1,000 ft. a few miles inland. There is anchorage southward of the latter point; *Rugged Peak*, 3,413 feet high, 10½ miles S.W. by W. ¼ W. from the point, is a good landmark. From San Fermin Point to the N.W. point of San Luis Gonzales Bay, a distance of 39 miles, the coast is mostly low, with a few bluffs, *Red Bluff*, about 10 miles southward of the point, being 100 ft. high. Several islets lie off this coast, from 1 to 4 miles distant, and varying from 75 to 626 ft. in height.

San Luis Island lies 1½ mile off the land, with a low sand-spit extending nearly a mile off its S.W. side; it is 729 ft. high, and good anchorage may be found on either side of the sand-spit, according to the wind, not approaching it within half a mile. *Cantada*, a rocky islet 478 ft. high, is connected with the northern end of San Luis by a reef 2 cables long, bare at low water. A dangerous rock 3 ft. above low water, lies 1½ mile N.W. by N. ¼ N. from

Cantada, and at $2\frac{1}{2}$ miles N.W. by W. from Cantada is a reef of rocks, some awash at low water, over half a mile in diameter. Another rock, awash at low water, lies nearly a mile due North from the N.W. end of San Luis.

San Luis Gonzales Bay affords good anchorage, protected from south-easters; its shores are low, and 12 miles up the river at its head are the ruins of the old mission of *Cumajuet*, near which are some pools of fresh water. From *Final Point*, the eastern point of the bay, the coast trends about S.E. by E. $\frac{1}{2}$ E., 20 $\frac{1}{2}$ miles, to Bluff Point, and is nearly all high and precipitous, with hills rising to over 1,900 ft. about a mile inland.

Bluff Point, on the West side of the northern entrance to *Ballenas* or *Whale Channel*, separating Angel de la Guardia Island from the shore, is a bold rocky bluff about 100 ft. high, and may be recognised by *Sharp Peak*, 3,189 ft. high, $6\frac{1}{2}$ miles S.W. $\frac{1}{2}$ W. from it. *Double Peak*, 5,440 ft. high, lies 13 $\frac{1}{2}$ miles S. by W. $\frac{1}{2}$ W. from the point. The tidal currents are very strong at times in *Ballenas Channel*.

ANGEL DE LA GUARDIA ISLAND, or *Angeles Island*, is over 40 miles in length, parallel with the coast, from which it is 7 to 12 miles distant, its greatest breadth being about 10 miles. It is high, rocky, barren, and uninhabited, except by iguanas and rattle-snakes. A range of mountains, 3,000 to over 4,000 ft. high, extends its entire length, being most elevated in the northern part. The whole of the western shore is inaccessible, and without any anchorage. On the eastern side are several open bays, where vessels may anchor sheltered from the prevailing winds. Abreast the island, and about 27 miles inland, was the mission of *San Francisco de Borja*.

At 3 miles northward of the South extreme of the island, a sharp bluff point with a hill, 772 ft. high, a mile northward of it, is a small strip of sand beach, at a quarter of a mile off which there is anchorage in 7 to 9 fathoms, protected from north-westerly winds. About $1\frac{1}{2}$ mile beyond this is a sharp point, off which is *Pond Island*, 1 mile long and 400 ft. high, connected to the point by a reef. The coast between *Pond Island* and *Rock Point*, a bold headland with cliffs over 500 ft. high, 12 miles to N.W. by N., forms an open bay in its southern part, where there is good anchorage protected from south-easterly winds. There is also anchorage just South of *Rock Point*, in 5 to 8 fathoms. From hence to *Bluff Point*, the N.E. extreme of the island, the distance is 26 miles to N.W. by W., the southern part of this coast forming a large open bay, and the northern part being a succession of rocky bluffs.

Puerto Refugio, westward of Bluff Point, and sheltered by *Mejia* and *Granite Islands*, consists of two harbours, with good anchorage sheltered from every wind. *Mejia Island* is over $1\frac{1}{2}$ mile long, and rises to a height of 857 feet, and has a dangerous reef extending 4 cables N. by E. of its northern point. *Granite Island*, about three-quarters of a mile eastward of *Mejia*, is a little over three-quarters of a mile long, and 281 ft. high; the channels on either side of it are over three-quarters of a mile wide, with 15 to 30 fathoms,

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leading to the eastern harbour, which is about $1\frac{1}{2}$ mile in extent either way. To enter, bring *White Rock*, near the centre of the harbour, and 41 ft. high, to bear about midway of the entrance of either, and steer for it, and after passing it steer for the best anchorage, about three-quarters of a mile due South of it, in $6\frac{1}{2}$ or 7 fathoms, sand. Some rocks extend off the shores of the islands.

The western harbour is about a mile long N.E. and S.W., by half a mile wide, and is entered from the westward between the South point of Mejia and a group of rocks lying off the N.W. point of Angel de la Guardia. A channel, 150 yards wide, between Mejia and an island lying between it and the shore, connects the two harbours, and by steering N. by E. $\frac{1}{4}$ E. through the centre not less than 4 fathoms will be found. To enter the western harbour, being northward of *Sail Rock*, a sharp conical rock, 167 ft. high, $1\frac{1}{2}$ mile S.W. $\frac{3}{4}$ S. from the South point of Mejia, steer for the middle of the entrance, keeping *White Rock*, in the eastern harbour, in range with the South end of the island which separates the harbours, until the eastern point of Mejia bears N. by E. $\frac{1}{4}$ E., when you will be in the best anchorage, 6 to 7 fathoms, sand and shells. Spring tides rise about 13 ft., neaps 9 ft.

From Bluff Point, before mentioned, the coast of the mainland trends S.E. by E., 26 miles, to Remedios Point, and is an almost unbroken succession of rocky bluffs, 50 to 150 ft. high, with no anchorage or shelter. *Remedios Point* is low and sandy, and southward of it is an open bay of the same name, 3 miles in extent, where anchorage may be found, sheltered from N.W. winds. The best is in 10 fathoms, off a red hill 200 ft. high, with Remedios Point bearing about N. by E. $\frac{1}{4}$ E., distant $1\frac{1}{2}$ mile. The tide rises about 12 ft.

From the S.W. end of Remedios Bay to the entrance of Angeles Bay the coast is composed of rocky bluffs, and off its northern part are three small islets, 15 to 30 ft. high, the two southern ones being of a whitish colour.

ANGELES BAY, abreast the southern end of Angel de la Guardia Island, is a fine sheet of water, covering an area of about 25 miles, almost completely landlocked, being protected by numerous islands. The shores are mostly sand beaches, and in the southern part shoal water extends some distance off from the shore.

The adjacent country is extremely wild and rugged. The hills are covered with large boulders. There are three springs of slightly brackish water at the foot of the highest hill (Round Top Mountain), and a bed of most excellent oysters is exposed at low tide. The water may be found by noticing the reeds which grow about it, and which are the only green things in the vicinity. The bay is apparently well known to the people inhabiting the interior, as there were many traces of old encampments, &c. There are plenty of turtle, and in certain seasons of the year there must be great quantities of water, but in December, 1850, all was dry and parched.—(*Lieut. Derby.*) The country is reported to be rich in copper and silver-lead ores, and sulphur.

Smith Island, the northernmost and largest of the islands off Angeles Bay,

is 4 miles long, and narrow, rising to a height of 1,554 ft. at its N.W. extreme, close off which is an islet, 60 ft. high. Another islet lies close off its western side, with some dangerous rocks half a mile N.W. of it. A white rock, 40 ft. high, lies a little over half a mile southward of Smith Island, and $1\frac{1}{4}$ mile to the south-eastward is an islet 125 ft. high.

There are several deep and safe passages into Angeles Bay, which may be safely used when the land can be distinguished. The southernmost is between *Red Point* and two islets, 50 to 70 ft. high, about 3 cables northward of it. Another passage lies between these islets and a dark reddish-coloured island, half a mile to the northward, which has a hill, 225 ft. high, on its southern side, with a monument on it. The passage between this island and a group of islands about $1\frac{1}{4}$ mile to the N.W., contains many rocks, sunken and awash, and is dangerous. The northern passage, a mile wide, is between Smith Island and a long narrow neck of land which extends $3\frac{1}{4}$ miles to the S.E. from the mainland, and is terminated by a rocky bluff; when up with this bluff, the channel passes between it and the group of islands last mentioned. The bight westward of the neck of land was not examined.

To enter by the southernmost passage, bring *Round Top Mountain*, 3,423 ft. high, lying 2 miles from the western shore of the bay, to bear S.W. by W. $\frac{1}{4}$ W., and steer for it till nearly up with *Red Point*, when keep in mid-channel, and steer West for the best anchorage, at the mouth of a small cove formed by a low sand-spit projecting over half a mile from the mainland in a southerly direction. In using the northern passage, keep well over towards the mainland, to avoid the dangerous rocks westward of Smith Island. After passing between the group of islands and the extremity of the narrow neck, keep at least a mile from the land to avoid a shoal extending off it, and when the point of the low sand-spit bears West, haul up for the anchorage. Spring tides rise about 12 ft.

Las Animas Bay.—From the West point of Angeles Bay to the entrance of Las Animas Bay the coast chiefly consists of sharp rocky points, with some outlying rocks off them, and backed by high land. From the N.W. point of the bay the coast trends 5 miles southward, and then bends round to the N.E. to *Las Animas Point*, which is a bold rocky bluff, 125 ft. high, $6\frac{1}{4}$ miles E. $\frac{3}{4}$ S. from the N.W. point; the enclosed bay affords good anchorage with protection from the prevailing winds. The best anchorage is in the southern part, in 6 to 12 fathoms, nearly on a line between the entrance of the small lagoon at the bottom of the bay and the point, or the islets off it, lying about 2 miles to the N.W.

At the back of Las Animas Point are some steep reddish-coloured hills, 300 to 500 ft. high, and from hence to the N.W. limit of San Rafael Bay the coast consists of rocky bluffs, backed by high mountains. *Barnabé Rocks*, two rocks only 2 ft. above the water, lie $3\frac{1}{4}$ miles southward of Las Animas Point, and from 3 to 4 cables off a low point, the channel between being only fit for

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San Rafael Bay is an open bay, affording good protection from southerly winds. Its shores consist principally of sand benches, and the interior land is covered with vegetation. *San Francisquito Point*, the eastern point of the bay, is a low rocky bluff, with a number of rocks lying close off it; at a short distance West of it, it is said that fresh water may be found at the foot of the hills.

Sal-si-puedes Channel separates the islands of San Lorenzo, and those to the N.W. of it, from the mainland; it is wide and deep, and through it the current sets strongly, especially with an ebb tide and a N.W. wind. The water being deep, there are few places where a vessel may anchor, but anchorage might be found near the western shore, or near Raza and Partida Isles.

To the S.E. of the South point of Angel de la Guardia Island are three small islands, once named *Las Arrinas*, *Animas*, or *Allen Islands*. They are composed of coarse clay slate, coloured trap, and trap tufa, and covered with caeti. Immense quantities of seals are found upon these, as well as most of the other islands of the gulf.

Partida Island, about 6 miles S.E. $\frac{1}{2}$ E. from the South point of Angel de la Guardia, appears from a distance like two islands, and is about $1\frac{1}{2}$ mile long, with two peaks 400 ft. high. On its western side is a small cove, open to the northward, with from 3 to 8 fathoms of water, and about one-third of a mile off the eastern side is a small islet, 75 ft. high, there being anchorage in 5 to 20 fathoms between, sheltered from N.W. winds. At 6 cables northward of Partida is *White Rock*, 175 ft. high, from which a reef extends about one-third of a mile northward, ending in a rock 2 ft. above low water.

Raza Island, $4\frac{1}{2}$ miles S.E. by E. from Partida, is about three-quarters of a mile long East and West, and 100 ft. high, the guano on it giving it a white appearance. On its South side is a pier, house, and flagstaff, about 3 cables off which there is anchorage in 5 to 8 fathoms, gravel and rock; a reef, extending a short distance off the S.E. point, must be carefully avoided. *Raza Rock*, 75 ft. high, lies over a mile N.W. by W. $\frac{3}{4}$ W. from the N.W. point of Raza; at 2 cables off its S.W. side is a rock awash. The guano on Raza has been worked for several years past, the company having removed over 10,000 tons in the first two years.

Sal-si-puedes Island, $4\frac{3}{4}$ miles S. by E. $\frac{3}{4}$ E. from Raza, is about $1\frac{1}{2}$ mile long N.W. and S.E., its highest peak, near the southern end, being 376 ft. high. Several detached rocks lie off the island, and nearly midway between it and the northern San Lorenzo Island is a rock awash; the channel is a mile wide, and, as it is probable there are other dangers, it should not be used.

San Lorenzo Island is $12\frac{1}{2}$ miles long, and from 1 to 2 miles wide; it is high and barren, the highest peak, near its southern end, being 1,592 ft. high. At 3 miles from the N.W. end is a narrow boat passage, dividing it into two, and at 3 miles south-eastward of this passage, on the West side of the island, is a sand beach, where landing may be effected in smooth weather. In N.W. winds, there is a good landing place at a small sand beach at the S.E. extreme of the island. The shore is generally bold.

San Esteban and *San Pedro Martir Islands* are described previously on pp. 142—143.

At 2 miles S.E. $\frac{3}{4}$ E. from *San Francisquito Point* is the N.W. point of *San Francisquito Bay*. The entrance is about a mile wide, and the bay is open to North and N.E., but affords good shelter from N.W. and S.E. winds. The best anchorage is in the S.W. part of the bay, in 5 to 6 fathoms, about a quarter of a mile off a sand beach. A shallow cove opens into the southern part of the bay; the country in the vicinity is extreme'y barren and stony. *San Gabriel Point*, the outer eastern point of *San Francisquito Bay*, is a rocky bluff 45 ft. high, with high volcanic hills behind it, and numerous rocks lying off it.

Santa Teresa Point, $1\frac{1}{2}$ mile South of *San Gabriel Point*, is a rocky bluff, 30 ft. high, and South of it is the small open bay of the same name. There is good anchorage in 8 or 9 fathoms, sheltered from N.W. winds, 3 or 4 cables S. by W. $\frac{1}{2}$ W. from the point; spring tides rise 10 ft., neaps 6 ft. On the low neck of land between *Santa Teresa* and *San Francisquito Bays* is the bed of an extensive fresh-water pond, which is dry during eight months of the year. At 32 miles nearly due West of *Santa Teresa Point* is a prominent sharp peak, 6,258 ft. high.

Between *Santa Teresa Point* and *Cape San Miguel*, $13\frac{1}{2}$ miles to S.E. by S. $\frac{3}{4}$ S., the coast is generally low. The cape is a bold rocky bluff, 150 ft. high, with some rocks lying close off it, and about 5 miles inland are some conspicuous mountains, 2,000 to 3,500 ft. high. Just South of the cape there is anchorage in 7 or 8 fathoms, half a mile off shore, sheltered from N.W. winds. A mile South of the cape is the northern end of a shoal extending 2 miles along the shore to the southward, with $2\frac{1}{2}$ fathoms on its outer edge at a quarter to half a mile off shore.

From *Cape San Miguel* to *San Carlos Point* the distance is 12 miles S. by E. $\frac{1}{2}$ E.; for the first $2\frac{1}{2}$ miles the coast is an almost continuous bluff, about 50 ft. high, after which it is generally low. At 7 miles southward of *Cape San Miguel* is *San Juan Bautista Point*, which is low, with shoal water extending a quarter of a mile off it. Between this point and *San Carlos Point*, which is also low, is the open bay of *San Juan Bautista*, with very regular soundings; the tide rises about 5 ft. At $9\frac{1}{2}$ miles W. $\frac{3}{4}$ S. of *San Carlos Point* is *Sharp Peak*, about 5,000 ft. high.

At 12 miles S.E. by S. $\frac{3}{4}$ S. from *San Carlos Point* is *Trinidad Point*, a

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prominent headland, 250 ft. high, with some rocks off it; northward of it is the open bay of *San Carlos*. Some detached rocks lie off this part of the coast and that to the southward. Extensive patches of red water were met with hereabout. At 7 miles S.E. of Trinidad Point is the shoal opening to a lagoon, and at 2½ miles farther on is a fresh-water creek which may be recognised by the grass and trees on its banks; its entrance is at a low shingle point, off which a shoal extends over a quarter of a mile.

Santa Ana Bay, comprised between this low shingle point and *Santa Ana Point*, 3½ miles to E.S.E., has very deep water nearly up to the shore, but there is anchorage, sheltered from the S.E. Off *Baja Point*, 7¼ miles E. by S. of *Santa Ana Point*, a shoal extends a short distance, and just South of it is the mouth of a cañon leading to the Reforma silver mine. About three-quarters of a mile south-eastward of the point is a landing-place, marked by a staff with a white flag.

Cape Virgenes, 4½ miles beyond *Baja Point*, is a rocky cliff about 200 ft. high, surmounted by a hill 600 ft. high. The water is very deep hereabout. From 12 to 14 miles inland are three remarkable mountains, known as *Las Tres Virgenes*, the highest and southernmost being 6,547 ft. high. They are the N.E. end of a belt of volcanic peaks, in the vicinity of which sulphur is said to be abundant.

From *Cape Virgenes* the land trends 3 miles to the south-eastward to a point marked by a monument, and then alters its direction to nearly South for 3½ miles, to the northern limit of *Santa Maria Cove*. The shore consists of broken bluffs, 30 to 200 ft. high, and about 3½ miles inland of the monument is *Santa Maria Mountain*, 4,424 ft. high, its ridge running parallel to the coast for several miles.

Santa Maria Cove is about three-quarters of a mile wide, with a shingle and sand beach at its head. Several rocks lie off the North point. There is anchorage in 5 or 6 fathoms, about a quarter of a mile from the beach, but open to S.E. winds. The southernmost of *Las Tres Virgenes* lies 15½ miles W. ½ S. from the anchorage, and is a good mark when making for it. Spring tides rise about 6 feet.

Between *Santa Maria Cove* and *San Agueda Point*, 6½ miles to S.E. ½ S., are six valleys or cañons, widely known for their yield of rich copper ore, which comes from the interior, and is shipped to Europe. The first is the *Cañon de Santa Rosalia*, 3 miles southward of *Santa Maria Cove*, and then about a mile apart respectively lie the *Canons de Soledad, de Purgatorio, de Providencia*, and *de San Agueda*. A little to the northward of the *Cañon de Santa Rosalia* is a ranch close to the beach, and at those of *Providencia* and *Purgatorio* there are landing piers. In anchoring off these cañons the lead must be kept constantly going, as the water is deep to within a quarter of a mile of the shore, and then shoals suddenly.

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Santa Agueda Point, the eastern entrance point of a lagoon and of the cañon of the same name, is low and sandy, with a shoal extending half a mile off it, and across the lagoon entrance. At $12\frac{1}{2}$ miles S.E. $\frac{1}{4}$ S. from Santa Maria Cove is a prominent point, surmounted by a red mound 60 ft. high, the coast between being a succession of bluffs of moderate height, with intervening sand benches. From this point the coast is low and sandy for 3 miles, to the entrance of *San Lucas Cove*, a safe anchorage in all weathers for small craft drawing less than 6 ft. water. The cove is about 2 miles in extent North and South, from a half to three-quarters of a mile wide, and from 3 to 6 ft. deep. A small sand island lies nearly in the centre of the narrow and shoal entrance, the channel being on the North side, with 6 to 9 ft. at low water.

Tortuga Island, 23 miles E. by N. $\frac{1}{4}$ N. of Santa Maria Cove, like most of the other islands in the gulf, appears rocky, barren, mountainous, and uninhabited. It is about 2 miles long E.S.E. and W.N.W., by a mile wide in the centre, its highest peak being 1,016 ft. high.

SAN MARCOS ISLAND, the North end of which is $15\frac{1}{2}$ miles S.W. $\frac{3}{4}$ S. from Tortuga Island, lies eastward of San Lucas Cove, being separated from the shore by *Craig Channel*, a little over a mile wide in its narrowest part, and through which a depth of 4 fathoms may be carried. The island is barren and hilly, about $5\frac{1}{2}$ miles long N.N.W. and S.S.E., varying in width from $1\frac{1}{4}$ to $2\frac{1}{2}$ miles; the highest peak, nearly in the centre, is 891 ft. high. There are extensive exposed deposits of gypsum on the island; pumice-stone is also found, and one of the hills is said to be entirely composed of tuff. Fresh water may be obtained near the North end, and goats are very abundant. There are several beds of pearl oysters around it.

The shores of San Marcos are chiefly composed of rocky bluffs, which are highest, 20 to 300 ft., on the eastern side. Off the North point, which is surmounted by a high hill, are three white islets 20 to 40 ft. high, and several detached rocks extending nearly half a mile northward. The South point is a low sand-spit nearly half a mile long, from which a rocky shoal extends $1\frac{1}{2}$ mile to the southward, forming the narrowest part of Craig Channel. There is good anchorage in 5 to 7 fathoms, eastward of the sand-spit, avoiding the shoal water extending nearly half a mile off the shore; the tide rises about 4 ft. *Lobos Rock*, 20 ft. high, with numerous sunken rocks around it, lies half a mile S.E. $\frac{1}{4}$ E. from the southern point of San Marcos.

From San Lucas Cove the coast trends $14\frac{1}{2}$ miles W. by N. $\frac{1}{4}$ N. to Chivato Point; it is generally low and sandy, with occasional bluffs, gradually sloping to the mountains. *Chivato Point* is low, with many rocks off it, and at $1\frac{1}{2}$ mile to the southward of it is *Santa Inez Point* or *Cape Barracas*, also low and rocky; the intervening coast is bluff, with a few outlying rocks. There is anchorage in 4 to 5 fathoms, under the lee of the latter point, half a mile off shore, sheltered from N.W. winds.

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from $4\frac{1}{2}$ to 5 fathoms may be carried through the channel between. They are surrounded by shoals and sunken rocks. The northernmost lies 2 miles E. $\frac{7}{8}$ S. from the point; the southernmost, also the largest and highest, is seven-eighths of a mile long and 30 ft. high, with shoal water extending off its low and rocky southern point. A 3-fathoms shoal, $1\frac{1}{4}$ mile long N.N.W. and S.S.E., lies three-quarters of a mile West of the southern island.

Santa Inez Bay is the large open bay lying between Santa Inez Point and *Colorado Point*, a reddish bluff, about 9 miles to the southward. The shore is generally low and sandy, and near Santa Inez Point are some conspicuous barren table-hills, the highest being *Barracas Table*, about 300 ft. high. At the bottom of the bay is a monument marking the southern boundary of the *Santa Magdalena Plains*, a tract of land acquired by a San Francisco company for forming a colony. The plains are several miles in width, extending along the coast to the northward, but it is said no fresh water can be found, and the surface is thickly covered with rocks, consequently the colony has never been established.

The old mission of *Guadalupe* was situated on the northern edge of the plain, at the mouth of San José Cañon. The remains of an aqueduct are still to be seen, but the mission buildings are entirely destroyed. Opposite San Marcos Island, and 18 miles inland, was the mission of *San Ignacio*.

MULEGE, or MOLEJE.—At a mile south-eastward of *Colorado Point* is *Prieta Point*, a low dark bluff, between which and *Sombrerito Point*, three-quarters of a mile to the southward, is the anchorage of Muleje. *Sombrerito Point*, so named from its shape, is a pyramidal-shaped rock, 119 ft. high, standing on a round pedestal on the North side of the mouth of Santa Rosalia River, and about $1\frac{1}{4}$ mile westward of it is *Colorado Peak*, a reddish peak 836 ft. high; they are both excellent landmarks for making the anchorage. In standing in steer for the peak, being careful not to bring it to bear South of W. $\frac{1}{2}$ S., as there is much foul ground near the coast South of that line, and anchor in 5 to 7 fathoms, half a mile from the beach.

Mulege, formerly the mission of *Santa Rosalia de Moleje*, is a small village about 2 miles up the stream named Santa Rosalia; the inhabitants, variously estimated at 500 to 1,000 in number, are engaged chiefly in mining, pearl-fishing, and raising and exporting fruits. Wood, water, vegetables, wine, and good beef, may be procured here; and game is abundant in the mountains. Sulphur and gypsum are found in the vicinity. The entrance to the river is narrow and shallow, with several rocks in it; it is high water here, on full and change, at about 7^h, and the tide rises about $3\frac{1}{4}$ feet.

The following observations on Mulege and its approaches are by Lieut.-Com. E. O. Woolridge:—"Point Concepcion is difficult to make out, when you have about a dozen of the same kind within a few miles of each other. However, the best marks I can give are some table land, which is very remarkable, and is rather to the right of Moleje village. Keep this about two points on

your starboard bow, and you may stand in until you discover some sandy islets, which are off a point called Punta Ynes. When you are East and West with them, you will be distant from them about 3 miles. After passing these islets, then steer South and S.S.W. until you make out the Pyramid Rock, spoken of by Capt. Hamilton. This rock is called Sombbrero, or Little Hat. I think it bad to call it Pyramid Rock, as there is a point which, in standing in, may be easily mistaken for it, resembling also a pyramid; but the rock is a pyramid fixed on a round pedestal like a fort. Another good way of making out this place is, when the wind is fair, to keep Tortuga Island, about 20 miles distant, bearing about N.W., and steer in S.E. till you make out the sandy islets, and proceed as above. There is a passage between the islets and the main land for small vessels, but, though very inviting, should not be attempted. I tried it, but getting into $2\frac{1}{2}$ fathoms, I put about as quick as possible. My anchorage marks in Molej6 Bay were as follow, in 5 fathoms:—Point Concepcion, N. 84° E.; Tortuga Isle, N. 4° W.; Lobos Isle, N. 2° E.; Sombbrero, S. 67° W.; Equipalito Rock, S. 22° W.; and Punta San Ynes, N. 10° W.

"This is very close in, but I wished to facilitate the watering; about half a mile farther to the northward, in 8 fathoms, is a very good berth. In going into the bay after making out the Sombbrero, if you wish to go close in, take care not to bring the Sombbrero at all on your starboard bow; that is, do not open the mouth of the river, as by sounding I discovered a rock with only 1 fathom on it, on a sandbank with 3 fathoms all round it, about three-quarters of a mile from the shore. It lies with the entrance of the river open, directly between Sombbrero and Equipalito Rocks, distant from one-half to 1 mile off shore.

"The report of the facility of watering is very delusive and uncertain. In the first place I cannot think it possible to water out of the river, as it is salt for at least 2 or $2\frac{1}{2}$ miles, and a great portion of the time boats could not possibly get up so far. I was there, fortunately, when the moon was nearly full, and the water was only low between eleven at night and four in the morning, so that I was enabled to water about eighteen hours out of twenty-four, and though I had but one small boat (23-ft. cutter), I managed to get 12 tons in two days. She had to go $1\frac{1}{4}$ mile up the river, to Padras. The water is delicious to drink at the stream, but it is so very low, and our water, after being a day or two on board, became so black, and smelt so strongly of decayed vegetable matter, that, though it improved by keeping, it served chiefly for cooking and washing."

Equipalito Rock lies on the South side of the entrance of Santa Rosalia River. An extensive shoal extends from the mouth of the river for $1\frac{1}{4}$ mile to the south-eastward of this rock, its outer edge being three-quarters of a mile from the land. At the back of it are several small lagoons. *Gallito Point*, $2\frac{1}{4}$ miles beyond Equipalito Rock, is the N.W. entrance point of Concepcion Bay; it is a conical rock, connected with the mainland by a strip of sand, and

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surrounded by shoal water. A rock, with 3 fathoms over it, is reported as lying about a mile north-eastward of Gallito Point; diligent search was made for it without success.

CONCEPCION BAY, the entrance to which is $3\frac{1}{2}$ miles wide, between Gallito and Aguja Points, extends over 22 miles in a S.S.E. direction, varying in width from 2 to 5 miles. There are several small islands in its western part, and a number of anchorages sheltered from all winds. The western shore has a very irregular outline, with many bluff points, and at the southern end of it is a lagoon, at the entrance of which are some small islands, and shoal water runs off about half a mile. The southern shore, known as *La Pasajera*, is low and sandy, like the eastern shore, the water shoaling gradually to the beach. The road between Mulege and Loreto passes close along the South end of the bay, and about a mile from the western side. The eastern shore has several low projecting points, and, except near Las Orillas Point, shoals extend off its entire length from a quarter to three-quarters of a mile.

San Pedro Point, a bold headland, about 100 ft. high, lies 5 miles S.E. of Gallito Point, the coast being low, with some bluffs about midway between. Shoals extend off a considerable distance on either side of the point, and for about 2 miles North and South of it the navigable channel is not over $1\frac{1}{2}$ mile wide. At 3 miles southward of San Pedro Point is the northern point of *Coyote Bay*, with shoal water off it; the bay is about $3\frac{1}{2}$ miles in extent North and South, and $1\frac{1}{2}$ mile East and West, but has a number of islets and rocks in it, making its navigation somewhat difficult.

For 3 miles S.E. of Coyote Bay the coast is formed by a series of bluffs; it then becomes low, and forms a small bay, with a ranch near its northern part, just South of which is a creek where inferior fresh water may be obtained. *Ranada Point*, a low bluff point, is the eastern point of this bay, and at 4 cables East of it is *Ricason Island*, half a mile long, and connected with the mainland by a narrow sand-spit. The coast continues low and sandy, with shoal water extending nearly half a mile off, and at $1\frac{1}{2}$ mile S.E. of Ricason Island is *Frigoli Point*, a sharp bluff point, 40 ft. high. From Frigoli Point the coast is nearly straight, with deep water close to, for about 3 miles to *La Tinaja Point*, which lies a mile northward of the lagoon, previously mentioned. This point is noted for a small well, just above high-water mark, which supplies the best fresh water found in Concepcion Bay.

Concepcion Point, the northern extreme of the peninsula forming Concepcion Bay, is about 30 ft. high, with numerous rocks off it. From hence the coast trends to the S.W. to *Aguja* and *San Domingo Points*, on the eastern side of the entrance to the bay. At $9\frac{1}{2}$ miles S.E. by S. $\frac{1}{2}$ S. from the latter point is *San Ignacio Point*, half a mile south-eastward of which is a ranch, with a small stream near it.

From Concepcion Point the coast trends $14\frac{1}{2}$ miles S.E. by E. $\frac{1}{2}$ E. to Colorado Point, with outlying rocks a short distance off the intervening points.

At 11 miles from the former point is a low point, with a rocky reef extending a quarter of a mile off; a conspicuous white mountain, 2,434 ft. high, lies $5\frac{1}{2}$ miles westward of this point. *Colorado Point* is a high red bluff, with many rocks off it, and at $4\frac{1}{2}$ miles E.S.E. is *Santa Teresa Point*, surmounted by a small sharp hill, and with many rocks off it; a conspicuous peak, 955 ft. high, lies a mile S.W. $\frac{1}{2}$ W. from it.

Between Concepcion and Santa Teresa Points the coast is high, rocky, and precipitous, affording but little shelter from the prevailing winds; patches of red water are frequently met with hereabout. *San Lino Bay*, South of Colorado Point, affords shelter from winds from West, round by South, to S.E., in from 4 to 8 fathoms; there is also said to be good anchorage near Santa Teresa Point.

San Nicolas Bay is a large open bay, lying between Santa Teresa and Santa Antonita Points, $10\frac{1}{2}$ miles apart S.E. $\frac{1}{2}$ S. and N.W. $\frac{1}{2}$ N. The western shore is bluff, with outlying rocks, and at 4 miles from Santa Teresa Point is a small cove, affording shelter to launches. The southern shore of the bay is low; several arroyos descend into its S.W. part from a conspicuous table-land, 1,235 ft. high, $2\frac{1}{2}$ miles inland. *Santa Antonita Point* is 15 ft. high, with shoal water extending a quarter of a mile northward of it; Pulpito Point lies $1\frac{1}{2}$ mile S.E. of it.

Ildefonso Island, $6\frac{1}{2}$ miles N. $\frac{1}{2}$ W. from Pulpito Point, is a barren rock, a little more than a mile long N.N.W. and S.S.E., half a mile wide, and 387 ft. high. A reef extends about a quarter of a mile off its northern end, but the passage between it and the mainland is apparently free from dangers.

PULPITO POINT, so named from its resemblance to a pulpit, is a bold headland, about 500 ft. high, with some detached rocks extending a cable off it; when first seen from the southward it appears like an island. There is excellent anchorage in 5 to 10 fathoms, southward of the point, and about a quarter of a mile from the beach, well sheltered from north-westerly winds; the tide rises about 4 ft. Along the western shore of the anchorage are numerous rocks, some over 300 yards off. In the northern bight is a sand beach and a good landing place. A triple-peaked mountain, 1,640 ft. high, and $3\frac{1}{2}$ miles S.W. $\frac{1}{2}$ S. from Pulpito Point, forms a good landmark.

Between Pulpito Point and Mangles Point, $14\frac{1}{2}$ miles to S.E. by S. $\frac{1}{2}$ S., the coast consists of rocky bluffs, with outlying rocks. It forms several prominent points, with intervening bays, where anchorage may be found.

San Basilio Bay.—At $2\frac{1}{2}$ miles S. $\frac{1}{2}$ W. from Pulpito Point is *Gull Rock*, between which and *San Basilio Point*, 6 miles to S.E. by S. $\frac{1}{2}$ S., is the open bay of San Basilio, with no bottom at 15 fathoms a mile off the shore, which consists of low bluffs, with intervening beaches. *San Basilio Point* is a red rocky cliff, 50 ft. high, surmounted by a hill, 450 ft. high; a few rocks lie off it, and to the southward is *San Juanico Cove*, behind one of the sand beaches in which is a fine-looking valley, where, it is said, fresh water may be procured.

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Mercenarios Point, about a mile farther on, is a rocky cliff of dark sandstone, surmounted by a red cone 519 ft. high; two small islets and a rock lie off a jagged, rocky bluff, 50 ft. high, three-quarters of a mile to the north-westward of the point.

MANGLES POINT, $4\frac{1}{2}$ miles S.E. by S. $\frac{1}{2}$ S. of *Mercenarios Point*, is a moderately high bluff, with a hill, 100 ft. high, rising abruptly from it. It is the southern end of a succession of cliffs of variegated colour, 200 to 300 ft. high. There is good anchorage in 5 to 9 fathoms, southward of the point, and nearly half a mile off shore, sheltered from north-westerly winds; but in making for it from the southward, care must be taken to avoid some rocks, the highest only 2 ft. above high water, which lie $2\frac{1}{2}$ miles S.E. by S. $\frac{1}{2}$ S. from the point, and about a mile from the land. The place is famous on the coast for its valleys, well supplied with wood of a superior quality; it is stated that fresh water can be procured. A double peak, $2\frac{3}{4}$ miles westward of the point, is an excellent landmark. The tide rises 3 to 4 ft.

San Bruno Creek entrance lies 4 miles S. by E. of *Mangles Point*; it is somewhat difficult to recognise unless close in, as the creek runs for $1\frac{1}{2}$ mile parallel to the coast, behind a narrow strip of land, on which are some high hills. The entrance is narrow, and shoal water extends about a quarter of a mile off it. The country here is fertile. At 8 miles S.E. by S. of the creek the bluff coast terminates, and a sand beach commences. Off *Tierra Firma Point*, three-quarters of a mile farther southward, a 3-fathoms shoal extends about a quarter of a mile; from hence to Loreto, 4 miles to the southward, there is good anchorage anywhere, in 3 to 7 fathoms, within half a mile of the beach.

Coronados Island, $1\frac{1}{2}$ mile N.E. $\frac{1}{2}$ N. of *Tierra Firma Point*, is irregular in form, about $1\frac{1}{2}$ mile long, North and South, by $1\frac{1}{2}$ mile wide, and attains a height of 928 ft. near its northern end. The shores consist of steep rocky bluffs, but a low spit of sand and stones, with some outlying rocks, extends three-quarters of a mile from its S.W. side. To the northward of this spit is an excellent anchorage, in which to ride out a south-easter. Nearly midway between the island and coast is a low islet, 3 cables long, surrounded by shoals. Between the islet and the S.W. point of *Coronados* the passage, with 4 to 5 fathoms, rocky bottom, is a quarter of a mile wide; the passage between the islet and the land is 4 cables wide, with a least depth of $3\frac{1}{2}$ fathoms.

LORETO, or Lloretto.—The anchorage at Loreto is pointed out by the church and a clump of palm trees, and it may be distinguished at a distance by a very lofty peak, surrounded by smaller hills. This mountain, called *El Cerro de la Giganta*, is 5,794 ft. high; it is of volcanic formation, like all the rest of the chain which runs through the peninsula.

In ordinary weather there is good anchorage off the town, in 8 or 9 fathoms, half a mile from the beach; the best position is with the church and Sugar-loaf Peak, 3,674 ft. high, in line. It is open to the winds from North, N.W.,

and S.W.; when they blow very strongly, the ship must get under way to escape being driven on shore. If she is of small draught, she may make for Puerto Escondido, $12\frac{1}{2}$ miles to the South. The tide rises 3 to 4 ft.

The mission of *Real de Loreto*, founded in 1697, opposite Carmen Island, was the capital of Lower California; but it became so much decayed that the authorities were transferred to the *Real de San Antonio*, but La Paz is now the capital. The presidio, the mission, and the church, very substantially built by the Jesuits, were intended to serve, in case of attack, as an asylum to the inhabitants. They are surrounded by a thick wall, which turns the waters of a torrent coming from the mountains, which several times has washed away the houses and the vegetable earth. The church, which was for a long time in a state of decay, contained many pictures, silver vessels, and jewels of considerable value, and, though left quite open, was considered safe from spoliation.

At the time of the *Narragansett's* visit it was a straggling village, containing about 150 inhabitants. The church, a large stone structure with a dome at one end, is in pretty good repair. Fresh beef, vegetables, fruit, and wood, may be obtained at the town, but water is said to be generally scarce, and that from the wells brackish and unwholesome. The country here is very fertile, producing all sorts of tropical and temperate fruits and vegetables. A road connects Loreto with Mulege.

Loreto was formerly the centre of a considerable pearl trade, and is the port of *Comandu*, an ancient mission, about 22 miles distant in the interior, with which it is connected by a road passing over the Sierra de la Giganta. There is a rich copper mine, known as El Sance, and not worked at present, at the foot of the mountains. The valley in which Comandu is situated is very fertile, and most of it in a high state of cultivation. The population is variously estimated at from 500 to 1,000.

From Loreto to *Nopolo Point*, a bold rocky point, 75 ft. high, the coast is a low sand beach. At $1\frac{1}{2}$ mile South of Loreto is *Primera Agua Point*, off which a shoal extends about half a mile, with 1 to 3 fathoms on it. A small shallow cove, westward of Nopolo Point, is sometimes used by small vessels. About 5 miles S.E. by S. of Nopolo Point is *Chuenque Bay*, the coast between consisting of pebble beaches, and bluffs 15 to 75 ft. high, with a depth of 10 to 15 fathoms within a cable's length of it. *Chuenque Bay* is small, but affords protection from all but northerly winds; to enter, pass northward of a small island on its eastern side, the southern passage being quite shoal.

Punta Coyote, $1\frac{3}{4}$ mile S.E. of Chuenque Bay, is a steep bluff headland, 75 feet high, the eastern extremity of a pear-shaped peninsula about $1\frac{1}{2}$ mile long and seven-eighths of a mile wide at its southern end, on which is a hill 350 ft. high. On its western side it forms *Puerto Escondido*, a perfectly landlocked and secure harbour for small vessels in all weathers. The entrance is only

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about 75 ft. wide, with 9 ft. on the bar at high water, but deepening to 4 and 7 fathoms within. It is about a mile long, and half a mile wide.

Between Coyote Point and *Candeleros Point*, a prominent steep bluff, about 50 ft. high, 6 miles to the S.E., the coast forms an open bay, in which the soundings are irregular, only $2\frac{1}{2}$ fathoms being found in some places at half a mile off. Inland are some high mountains. About $2\frac{1}{2}$ miles southward of Coyote Point is a strip of sand beach, behind which is a fertile green slope with a ranch at its foot. Plenty of good fresh water may be procured here from wells 10 to 15 ft. deep. At $3\frac{1}{2}$ miles N.W. by W. $\frac{1}{2}$ W. from Candeleros Point is a group of rocks, 15 to 40 ft. high, the outermost a mile off shore, with 2 to 3 fathoms water, foul ground, between.

Los Candeleros are three pinnacle-shaped rocks, 40 to 120 ft. high, lying between Candeleros Point and Danzante Island, the passage between which should be used with great caution, as other rocks may exist.

Danzante is a barren island, lying $2\frac{1}{2}$ miles N.W. $\frac{3}{4}$ N. from the point; it is $3\frac{1}{2}$ miles long, nearly a mile wide, and rises to a height of 450 ft. The shores consist of bold rocky bluffs, 25 to 75 ft. high, with deep water close-to, but on the S.W. side is a strip of sand beach, off which anchorage may be found. A pinnacle rock, 25 ft. high, lies off the southern end, and about half a mile of the North end of the island is detached by a shallow channel, full of rocks. The channel between Danzante and Carmen is $1\frac{1}{2}$ to $2\frac{1}{2}$ miles wide, much used by vessels bound to Loreto; the tidal currents are very strong in it.

CARMEN ISLAND is 17 miles long N.N.E. and S.S.W., and $5\frac{1}{2}$ miles wide in its northern part; it is of volcanic origin, and has a range of peaks, 500 to 1,500 ft. high, extending throughout its entire length. It is inhabited, and on August 21st, 1873, some violent earthquake shocks were felt on it.

Punta Baja, the low South point of Carmen Island, lies 5 miles N. $\frac{1}{2}$ E. from Candeleros Point, with shoal water extending more than a quarter of a mile off it. At $2\frac{1}{2}$ miles N.W. of Punta Baja is *Punta Arena*, the coast between being a sand and gravel beach. There are some huts on the beach near Punta Arena, at the back of which are some sharp peaks, 600 to 900 ft. high. At 3 miles farther northward, the coast consisting of rocky bluffs and deep ravines, is *Marquez Bay*, which is small, with some huts close to a small sand beach at its head. Northward of this bay the coast is generally steep and rocky, with moderately deep water close to. *Puerto Ballandra*, $8\frac{1}{2}$ miles from Marquez Bay, is about 4 cables in diameter, with 5 to $5\frac{1}{2}$ fathoms in most parts; the entrance, between high headlands, is scarcely 3 cables in width.

At $1\frac{1}{2}$ mile northward of Puerto Ballandra is the bluff N.W. point of the island, at a quarter of a mile off which, with 1 to 3 fathoms between, is *Cholla Islet*, a low sand island, about one-third of a mile long, and 20 ft. high, with some rocks off its N.W. end. Between the N.W. point and Tintoreria Point, $2\frac{1}{2}$ miles to N.E. $\frac{1}{2}$ N., is *Oto Bay*, in which vessels may anchor shel-

North Pacific.

tered from southerly winds. There are a few deserted huts at the bottom of the bay.

Tintorera Point is a steep bluff, about 80 ft. high, with some rocks off it, and at $1\frac{1}{2}$ mile to the eastward is *Puerto de la Lancha*, a small open bay, with $2\frac{1}{2}$ to 7 fathoms water, with anchorage sheltered from southerly winds. A short distance farther eastward is a small landlocked cove, $2\frac{1}{2}$ cables long and a cable wide at the entrance, with a depth of 3 to 5 fathoms; there are some deserted huts near its head. *Lobos Point*, the N.E. extreme of the island, is a rocky headland, 125 ft. high, surrounded by detached rocks; the coast here turns abruptly to the southward, and for over 6 miles, to *Perico Point*, consists of rocky bluffs, with occasional detached rocks. *Perico Point* is a sharp rocky cliff, surmounted by a reddish peak, 460 ft. high; near it is a detached rock, 50 ft. high, 150 yards southward of which is a sunken rock.

Salinas Bay, westward of *Perico Point*, has good anchorage in 5 to 6 fathoms, sheltered from all but S.E. winds. The tide rises about $3\frac{1}{2}$ ft. It was surveyed by Capt. Kellett, H.M.S. *Herald*, in 1849; he places its head in lat. $25^{\circ} 59' 34''$ N., long. $111^{\circ} 5' 45''$ W., very closely approximating to the late survey by the U.S. officers.

The bay is about $3\frac{1}{2}$ miles wide, and 2 miles deep. Near its head, but partitioned off from the sea by a strip of shingly beach, about a quarter of a mile wide, over which the water never flows, is a lake, about $1\frac{1}{2}$ mile long and a mile wide, the bottom of which is covered with pure white crystals of salt—chloride of sodium—without any admixture or adulteration in the shape of sand, algæ, or other salts. Commander Dewey says the water rises and falls with the tide, but Dr. Bell states that usually no water covers this area, and the salt has only to be raked up, packed in large sacks, and shipped to San Francisco. Here it is ground and sold, without any purification, as the finest table salt. Holes have been dug 10 ft. deep through pure crystals of salt. Fine volcanic mountains form a semi-circle around this lake, and when it rains the drainage from them flows into this basin, and covers it to the depth of a few inches. It is supposed that the salt is thus washed down from some large natural deposits. There are, also, some fine beds of the long-shelled oyster hereabouts, which are shipped to San Francisco. The lake is connected by railway with a landing-place in the bay, and on the narrow shingle beach is a small village. Fish and turtle are abundant here.

White Point, the S.W. point of *Salinas Bay*, is a steep bluff point, with some rocks extending about a cable off it. At 2 miles South of *White Point*, the coast between being steep and rocky, is *Gavelones Point*, about 1 mile N.W. by W. of which is a sharp peak, 1,491 ft. high. To the South of this the coast mainly consists of steep bluffs, and about $2\frac{1}{2}$ miles from the point is a small stream, where it is said fresh water may be procured. *Colorado Point*, $2\frac{1}{2}$ miles farther South, is a reddish bluff point; a sunken rock, reported to lie off it, was searched for without success. Here the coast recedes, forming the

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open bay of *San Francisco*, where the bluffs become lower, terminating in a sand beach which extends to Punta Baja, before described, with shoal water extending some distance off.

Monserate Island, 10 miles S.E. by E. $\frac{1}{2}$ E. from Punta Baja, is perfectly barren; it is 4 miles long North and South, and 1 to 2 miles wide, rising to 734 ft. in height. The southern and eastern shores consist of bold rocky bluffs, off which rocky ledges project under water in some places from one-eighth to a quarter of a mile off shore. Some rocks lie off the North and N.E. points, and on the North side is a small bight. The West side is a low rocky shore, with shelving points. At $1\frac{1}{2}$ mile to the northward are *Las Galeras*, two rocky islets, the easternmost and largest being 70 ft. high, and the other 40 ft. high. A rocky reef extends nearly half a mile S.E. of the eastern rock, and between the two is a narrow passage full of rocky ledges. At $1\frac{1}{2}$ mile North of them is a dangerous rock, only about a foot above high water.

Santa Catalina Island, $11\frac{1}{2}$ miles eastward of Monserate, is $7\frac{1}{2}$ miles long North and South, and about 2 miles wide, rising to a height of 1,534 ft. Its shores are said to be abrupt, and there is reported to be a landing-place on a sandy beach at its southern end.

The Coast.—From Candeleros Point to San Cosme Point, $10\frac{1}{2}$ miles to S.E. $\frac{1}{2}$ S., the coast is a succession of bluffs and sand beaches, the mountains inland rising to 2,000 ft. in height. *White Rock*, 127 ft. high, and surrounded by numerous smaller ones, lies 4 miles S.E. $\frac{1}{2}$ E. from Candeleros Point, and about 2 miles off shore. *San Cosme Point* is a rocky cliff, rising abruptly to a hill 225 ft. high, 4 miles south-westward of which is a sharp twin-peak, 3,808 ft. high, an excellent landmark. *San Cosme Rock*, 75 ft. high, about a mile northward of the point, is the westernmost and highest of a group; one-third of a mile eastward of this is *San Damien Rock*, 45 ft. high; and about one-third of the distance between the latter and the point are some rocks, 2 to 4 ft. above water, with some awash.

From San Cosme Point the coast trends about 2 miles to the S.E., when a stretch of sand beach, about 2 miles in extent, commences, on which are some ranches and an arroyo. At the East end of the beach is a rocky bluff point with two rocks N.W. of it, and at a mile farther eastward is *San Pasquel Point*, a similar point, with a large white rock a cable north-eastward of it. San Pasquel Point is the western limit of *Agua Verde Bay*, a small bay having good anchorage in ordinary weather, and where water may be obtained from a ranch near the beach. The best landing is in the eastern part of the bay, near a bluff point. At $1\frac{1}{2}$ mile farther eastward the coast turns abruptly to the southward for half a mile to San Marcial Point.

San Marcial Point is a rocky cliff, surmounted by a peak 1,131 feet high. *San Marcial Rock*, $1\frac{1}{2}$ mile N. $\frac{1}{2}$ E. from the point, is small, and 25 ft. high, with numerous smaller rocks around it, and a small rock awash about a quarter of a mile N.N.W. of it. There is a depth of 4 to 8 fathoms between the rock

and the land. At a quarter of a mile south-eastward of San Marcial Point is a dangerous reef awash, on which the sea always breaks, about one-third of a mile long E.S.E. and W.N.W., with 9 and 10 fathoms between it and the point.

Between San Marcial and San Telmo Points, a distance of 14 miles, the coast is nearly straight, with bluffs from 75 to 350 ft. high, and a few short stretches of sand beach. A depth of 10 to 30 fathoms is found within half a mile of it. Between San Marcial Point and a bluff $1\frac{1}{2}$ mile South of it, is the small bay of *San Marte*, where vessels may find anchorage in good weather in from 10 to 12 fathoms, within one-third of a mile of the small sand beach at the bottom of it. The land here is extremely mountainous. *San Telmo Point* is sharp and rugged, 30 ft. high, with numerous rocks close off it; on either side the bluffs are of a reddish colour. Nearly $6\frac{1}{2}$ miles to W. $\frac{1}{2}$ S. is a conspicuous table-mountain, 2,818 ft. high.

Between San Telmo Point and Nopolo Point, $19\frac{1}{2}$ miles to S.E. $\frac{1}{2}$ S., the coast recedes considerably, and is a succession of rocky bluffs, sand beaches, and deep ravines, with several islets and rocks off it, and backed by a mountain range about 2,500 ft. high. *San Carlos Bay*, southward of San Telmo Point, affords good anchorage in 5 to 7 fathoms; there is a lagoon at its head. *Black Rock*, 55 ft. high, at the South side of this open bay, lies about a mile from the shore, the passage between being apparently safe for small vessels. At $2\frac{1}{2}$ miles southward of Black Rock are *Moreno Rocks*, with shoal water between them and the land half a mile distant; the highest is 40 ft. high, and has a rocky reef extending a quarter of a mile S.E. of it. About 2 miles southward of these rocks is a lagoon. The coast here is a pebble beach, with occasional red and yellow bluffs, 10 to 25 ft. high. A mountain, 2,534 ft. high, $4\frac{1}{2}$ miles inland, is a good landmark hereabout.

Habana Island is a barren rock, about half a mile long, and 90 ft. high, lying $5\frac{1}{2}$ miles S.E. $\frac{3}{4}$ S. from Moreno Rocks, and over a mile off shore, with 10 to 17 fathoms between. It is covered with white guano, and West of it is a small indentation in the coast, known as *Tambaliche Roads*. At $2\frac{1}{2}$ miles South of the island is a conspicuous red rocky bluff, the N.W. limit of *Dolores Bay*, a slight indentation in the coast line. On the South side of the bay is *Dolores Point*, near which is a ranch. A few miles inland is the old mission *Virgen de Dolores*. *Los Burros* is a conspicuous, broken, rocky cliff, 300 to 500 ft. high, similar to Dolores Point, from which it is 3 miles distant. At 2 miles farther south-eastward is Nopolo Point, for about $3\frac{1}{2}$ miles north-westward of which is a succession of rocky bluffs, 400 to 500 ft. high.

Nopolo Point is a rocky cliff, backed by a rugged peak 1,578 ft. high. From hence to San Evaristo Point, $6\frac{1}{2}$ miles to S.E. $\frac{3}{4}$ S., the land is high and precipitous, with deep water close to the shore. It is said fresh water may be obtained from an estero about $1\frac{1}{2}$ mile southward of Nopolo Point. *San Evaristo Point* is a rocky headland, 130 ft. high, projecting three-quarters of a mile

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seaward; there is a ranch in the bight on its northern side. Close southward of the point is a cove, about three-quarters of a mile deep, where there is anchorage; rocky bluffs, 20 to 50 ft. high, extend a mile S.E. of it, and then, for $4\frac{1}{2}$ miles, a sand beach follows with only one short bluff, when high cliffs again commence and extend $1\frac{1}{2}$ mile to Mechudo Head. There is good anchorage in 5 or 6 fathoms, at half a mile from the beach, southward of a sandy point 2 miles southward of San Evaristo Point.

Santa Cruz Island, $10\frac{1}{2}$ miles eastward of San Telmo Point, is a barren rocky island, 1,500 ft. high, $3\frac{1}{2}$ miles long N.E. and S.W., and about $1\frac{1}{2}$ mile wide. Its eastern side consists of bold bluffs, 300 to 1,000 ft. high; the only landing-place is at the S.W. extreme, where there is a short stretch of gravel beach.

San Diego Island, $3\frac{1}{2}$ miles S.S.E. of Santa Cruz, is 722 ft. high, and nearly a mile long N.E. and S.W. A reef of rocks, over which the sea usually breaks, extends 8 cables from the S.W. point, ending in a small rock awash. Nearly half a mile farther to the S.W. $3\frac{1}{2}$ fathoms was found, when the depth increased suddenly. The passages between this island and Santa Cruz and San Josef are apparently clear of danger, but the latter has not been thoroughly examined.

SAN JOSEF ISLAND, $5\frac{1}{2}$ miles S. $\frac{1}{2}$ E. of San Diego, is of volcanic origin, $16\frac{1}{2}$ miles long N.W. and S.E., and 2 to 6 miles wide, rising to a height of 2,077 ft. near its centre, and terminating at its northern end in a sharp point. It is mostly covered with vegetation, and large numbers of deer exist on it. It is separated from the coast, previously described, by *San Josef Channel*, $2\frac{1}{2}$ miles wide at its narrowest part, near the northern entrance. This channel is much used by sailing vessels beating up the gulf, whereby they avoid the heavy sea outside, and can take advantage of the strong tides which set through it, varying from 1 to 3 knots. In bad weather anchorage can be found in the numerous bights and coves on both sides of it. At night, or in thick weather, it is recommended to keep well over toward the western shore, where there are no outlying dangers.

From the S.E. point of San Josef a sandy beach trends about $3\frac{1}{2}$ miles W. by S. to the S.W. extremity, a long low sand-spit, on the northern side of which is the opening to a lagoon. There is 20 fathoms within a cable's length of the S.W. point, at $1\frac{1}{2}$ mile north-eastward of which is the *Rio San José* entrance.

Amortajada Bay is formed between the S.W. point and Salinas Point, $4\frac{1}{2}$ miles to N.W. $\frac{1}{2}$ W., and is $1\frac{1}{2}$ mile deep. In its southern part there is good anchorage in 7 or 8 fathoms, protected from all winds, especially the dreaded cordonazos or S.E. gales. Fresh water may be obtained here. *Cayo Islet*, 40 feet high, and 8 cables N.W. by W. $\frac{1}{2}$ W. from the S.W. point, protects the anchorage from N.W. winds; a reef extends about a quarter of a mile off its northern end. *Salinas Point* is sandy, and near it are two lagoons producing large quantities of salt.

For $3\frac{1}{2}$ miles northward of Salinas Point the coast is a low sand beach, at the northern end of which is a ranch, for 2 miles North of which steep hills rise immediately from the water. About half a mile North of the ranch is the mouth of a deep stream. The coast then again becomes low to a point opposite Nopolo Point, and here San Josef Channel is only $2\frac{1}{2}$ miles wide. In the bight southward of the eastern point there is good anchorage in 5 to 10 fathoms, 200 to 300 yards from the shore. Just North of this point is the shallow entrance of a lagoon, and thence to the North point of the island, a distance of 4 miles, the coast trends nearly North, an unbroken line of steep, dark, rocky bluffs. A reef extends about a mile off the North point, and about $1\frac{1}{2}$ mile southward of it is a sharp peak, 1,382 ft. high.

The eastern side of San Josef was not closely examined; it consists of high rocky bluffs, with intervening sand beaches. At *Red Point*, nearly 9 miles E.S.E. from the North point, the coast alters its direction to S. by E. $\frac{1}{2}$ E. for 9 miles to the S.E. point, a hill rising abruptly to 400 ft. high, off which are several rocks. For 5 miles northward of this point there is a series of inaccessible bluffs, 50 to 500 ft. high.

Las Animas are a group of rocky islets, not over a quarter of a mile in extent, lying $10\frac{1}{2}$ miles E. by S. $\frac{1}{2}$ S. from the North point of San Josef; the largest and highest is about 90 ft. high.

San Francisco Island, on the East side of the southern entrance to San Josef Channel, lies nearly $4\frac{1}{2}$ miles N.E. $\frac{1}{2}$ E. from *Mechudo Point*. It is irregular in shape, with an area of about $1\frac{1}{2}$ square mile, the shores chiefly consisting of rocky bluffs, from 20 to 150 ft. high, with intervening sand beaches. The S.E. end is a rocky peninsula, 300 ft. high, and off the northern and southern points there are numerous rocks; a depth of $2\frac{1}{2}$ fathoms is found at a quarter of a mile off the N.W. side. There is anchorage in 5 to 10 fathoms off a sand beach just West of the S.E. head.

The channel between San Francisco and San Josef is about $1\frac{1}{2}$ mile wide, with from 4 to 6 fathoms, but *Coyote Rocks*, near the centre, and *Seal Rocks*, farther westward, make it very dangerous. Between *Coyote Rocks*, the highest 40 ft. high, and San Josef, the channel is less than half a mile wide, with 6 to 7 fathoms in it; if obliged to pass between San Francisco and San Josef, it is safest to keep close to the latter. *Seal Rocks*, $1\frac{1}{2}$ mile West of the North point of San Francisco, consist of two flat rocks, about 5 ft. high, with several sunken rocks around them.

ESPIRITU SANTO ISLAND, forming part of the eastern side of La Paz Bay, is 12 miles long N.W. by N. and S.E. by S., and 2 to 4 miles wide; it is of volcanic origin, with numerous peaks, the highest of which is 1,970 feet high. Rich copper mines are stated to exist on it. *Lupona Point*, its southern extremity, is low and sandy, and between it and *Bonanza Point*, the next to the N.E., the coast consists of alternate bluffs and sand beaches. From hence white sand cliffs extend for $1\frac{1}{2}$ mile to a mound of boulders, and then the coast

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Lobos Point, the easternmost point, is a high rocky bluff, and from hence the coast falls away to the N.W., generally bluff, with short stretches of sand beach. A reef extends a quarter of a mile off a rocky point 4 miles from Lobos Point, and here the island is nearly divided by an indentation on either side. *Isla Partida*, the northern portion, is joined to the main part by a neck of land less than 300 yards wide.

The northern point of Espiritu Santo is a rocky bluff, and about half a mile off it are *Los Isletes*, three flat rocky islets, two of which are 50 to 60 ft. high; the third is a large rock, about 5 ft. high, westward of the other two. The narrow channels between them are only navigable by boats.

The western side of Espiritu Santo is similar to the eastern side. About $2\frac{1}{2}$ miles from the North end is *El Cardonal*, a small inlet, three-quarters of a mile South of which is a cove, in which there is said to be snug anchorage for small vessels. *Ballenas Island*, 228 ft. high, lies about half a mile off the middle of the western shore of the island, with 3 to 8 fathoms between; it is about three-quarters of a mile long East and West, barren, and surrounded by rocky bluffs.

A short distance south-eastward of Ballena Island are *Gallo* and *Gallina*, two small islands, between which and the shore is a partially protected anchorage, frequently used by coasters. *Prieta Point*, 2 miles farther to the S.E., is a sharp, dark, bluff point, descending in several steps from the hills. *Gabriel Bay*, between Prieta Point and the next to the S.E., is of considerable extent, but with very shoal water except in its outer part; vessels anchoring here should keep outside the 5-fathoms line. *Dispensa Point*, the S.W. extremity of the island, is a rocky bluff, one-third of a mile northward of which is a conspicuous red mound, 213 ft. high, composed of lumps of lava. Between Dispensa and Lupona Points less than 3 fathoms is found at three-quarters of a mile from the shore.

LA PAZ BAY is an extensive indentation, about 40 miles long North and South, and from 16 to 20 miles wide, with deep water, and said to be free from hidden dangers. At its S.E. end is the town of La Paz, the capital of Lower California.

Mechudo Head, the northern limit of La Paz Bay, lies $16\frac{1}{2}$ miles N.W. by W. $\frac{1}{4}$ W. from the North point of Espiritu Santo Island; it is a bold, stratified cliff, about 300 ft. high, surmounted by a dome-shaped hill 750 ft. high. At $3\frac{1}{4}$ miles westward of it is *Mechudo Mountain*, 3,672 ft. high, the only prominent peak of a range of table-mountains extending to the southward; it is visible upwards of 50 miles, and, with the headland, makes an excellent landmark. There is said to be plenty of game hereabout.

For 5 miles S. by W. of Mechudo Head the coast consists of perpendicular

bluffs, 150 to 200 ft. high, and then for some miles farther southward it consists of sand benches backed by sand-hills. Bluffs then again commence gradually, increasing in height to *Coyote Point*, a perpendicular, white, rocky point, 19 miles S. $\frac{1}{2}$ E. from Mechudo Head. To the southward of Coyote Point, as far as the S.W. angle of the bay, the coast presents a long range of table-land, 500 to 1,000 ft. high, ending in cliffs 50 to 100 ft. high, with shingle beaches interspersed. At $5\frac{1}{2}$ miles South of Coyote Point is San Juan ranch, just westward of which is a conspicuous dark peak, 1,431 ft. high.

From the S.W. corner of the bay the southern coast for the first 6 miles consists of sand-hills, 25 to 75 ft. high, and then for 8 miles eastward, to the eastern end of El Mogote, it is low and sandy, covered at a short distance from the beach with shrubs and bushes; shoals extend nearly a mile off all this coast, the depth on them varying from $4\frac{1}{2}$ ft. to 3 fathoms.

LA PAZ HARBOUR.—*El Mogote* is a low sandy peninsula, 5 miles long East and West, protecting the northern and western sides of the harbour. A boat passage passes near its N.E. point, with less than 6 ft. at low water, entering the main channel opposite the town. *Prieta Point*, on the East side of the entrance of the channel leading to La Paz, is a sharp, perpendicular, gray bluff, 32 ft. high; some rocks lie off it, and shoal water, rocky bottom, extends about a quarter of a mile S.W. of it. Nearly 3 miles N.E. by E. $\frac{1}{2}$ E. from it is a hill, 1,527 ft. high, with a conspicuous tree on its summit.

From Prieta Point to La Paz the distance is $3\frac{1}{2}$ miles; vessels of 16 ft. draught may use the channel to La Paz at any time of tide, but should always take a pilot, as it is narrow and tortuous, with steep banks on either side. The northern entrance is usually marked by a buoy on each side. If obliged to use the channel without a pilot, an experienced eye aloft and the lead are the only guides that can be depended on. About a mile southward of Prieta Point is an entrance to the channel, through which $1\frac{1}{2}$ fathom may be carried; it is not over 100 yards wide, but is much used by small coasters, who enter it by bringing the North point of a large detached rock on the shore to bear E.S.E.

When waiting for a pilot, vessels may anchor anywhere southward of Prieta Point, in from 7 to 10 fathoms. The best anchorage at La Paz is from 200 to 300 yards westward of the wharf, in $3\frac{1}{2}$ fathoms, sand; vessels drawing less than 12 ft. can lie at the end of the wharf. Beyond La Paz the channel curves to the westward, terminating in a large lagoon, a channel with 2 to 3 fathoms leading to its N.W. limit. It is high water at the anchorage off La Paz, on full and change, at 8^h 27^m; the tide rises $4\frac{1}{2}$ ft.

The town has a population variously estimated at from 2,000 to 4,000. Cortes landed here, May 3rd, 1535.* It is a beautiful little place, nestled

* The Port of La Paz was named at the time of its discovery Bahia de Santa Cruz; afterwards it was called under the name of Porto del Marquez del Valle (Cortes), and lastly that by which it is now known. It was during his stay in this bay that Cortes received the un-

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amongst palm trees at the extremity of the inlet, surrounded by bold mountains of variegated volcanic rock, so common along the coast of Lower California. Many of the streets are lined with trees. The climate is very healthy, though very hot in summer; terrible hurricanes sometimes occur in September, October, and November.

Fresh beef, vegetables, bread, fruit, wood, and water may be procured in small quantities; the latter is obtained from wells. Snakes are said to be very numerous and venomous. An extensive trade is carried on with the other towns on the gulf, and with the settlements in the interior; it is the centre of the pearl trade, and a prominent port for the export of silver.

At La Paz, the Rio Yaqui, and Guaymas, eight or ten small vessels, of 20 to 40 tons, are fitted out for the pearl fishing. The divers are all Yaquis Indians, and will bring up shells from a depth of 8 fathoms. The fishing begins in May, and ends in October. The principal pearl banks in the gulf are in the Bay of La Paz and near Loreto, the S.W. point of the Isle Carmen, Puerto Escondido, Los Coronados, Los Danzantes, San Bruno, and San Marcos Islands. The business is principally in the hands of Germans.

Near the old mission of *San Antonio*, about 40 miles S.E. of La Paz, are the silver mines of *Triunfo*, the property of an American company. Gold is found in small quantities towards the granite range of San Lazaro, and copper ore is said to exist near the Calabazas, 16 miles from the Triunfo mines, on the road to La Paz.

In La Paz Bay, from May to November, north-westerly winds prevail during the day, with light airs from the south-eastward by night. During the remainder of the year, winds from S.E. to S.W. prevail day and night.

To the North of Prieta Point is a small bay, full of shoals and coral reefs; *Colorado Point*, on its North side, is a bold, rocky, red bluff, about 50 ft. high, with rocks lying a cable off it.

Pichilingue Harbour.—Northward of Colorado Point is *San Juan Nepomucino Island*, 1½ mile long North and South, and 3 cables wide, between which and the land is the small harbour of Pichilingue, one of the best on the coast, being protected on all sides. The western shore of the island is a steep bluff, and at 4 cables below its northern end is a rock awash, a cable off shore. A gravel beach extends around the southern end, and near the S.E. end, a rocky bluff, is a small hill 75 ft. high, its western side sloping to a small salt lagoon, yielding large quantities of salt. The eastern side of the island is mostly a shelving sand and gravel beach. There is a coal depôt for the U.S. navy at the S.E. end. The natives have a tradition that a large amount of treasure is hidden somewhere on the island.

pleasant news of his disgrace, brought on by the jealousies which his great services raised, and that, not less painful, news of the arrival of the first Mexican viceroy, sent to replace him in the command.

North Pacific,

The harbour is about one-third of a mile wide, with a depth of $4\frac{1}{2}$ to 6 fathoms, and is easily entered from the southward; the northern end of the island is connected with the land by a shoal with only 3 ft. water over it. Small quantities of tolerably good water may be obtained from a well in a valley on the eastern shore. Very fine pearls used to be found in this vicinity.

For vessels not wishing to enter the harbour of La Paz, or those of over 20 feet draught which cannot reach that place even at high water, Pichilingue affords an excellent anchorage. The wind is fair for boats to go from hence to La Paz during the day, and fair to return toward evening and during the night. It is high water at the entrance, on full and change, at 8^h 30^m; springs rise $4\frac{1}{2}$ ft. To the South of the eastern point is *False Bay*, a cove about three-quarters of a mile in extent N.E. and S.W., with 5 and 6 fathoms in its outer part.

A vessel anxious to keep on the coast of Mexico, or in its neighbourhood, during the bad season, cannot do better than run over to the Bay of La Paz on the West shore of the Gulf of California, and but little to the North of Mazatlan. In approaching it from Mazatlan the Island of Cerralbo will be first made, high and mountainous, and from it Espiritu Santo will be seen bearing about W. by N.

Capt. Richmond says (1854) that the lead is not to be trusted in La Paz Bay, as the water shoals very suddenly from 20 fathoms into danger on its western shore, as well as against the islands to the East.

Lobos Island, northward of San Juan Nepomucino Island, is a quarter of a mile long, and 90 ft. high, lying $1\frac{1}{2}$ cable off shore. It is covered by a light deposit of white guano. *Lobos Rock*, three-quarters of a mile northward of Lobos Island, and half a mile off shore, is 12 ft. high. Eastward of the rock is a small cove, with 2 to $2\frac{1}{2}$ fathoms water, which would afford good shelter for small vessels. *Diablo Point*, $1\frac{1}{2}$ mile N. $\frac{1}{2}$ E. from Lobos Rock, is a sharp rocky bluff; between it and *San Lorenzo Point*, $1\frac{1}{2}$ mile to the north-eastward, the shore recedes, forming a small cove, named *Puerto Balandra*, having 12 fathoms in its entrance, but inside the 3-fathoms line it is full of rocks and shoals.

San Lorenzo Channel, separating Espiritu Santo Island from the mainland, is $3\frac{1}{2}$ miles wide, but has some dangerous rocks and shoals in it, rendering great caution necessary when navigating it. *Coyote Point*, the S.E. point of the entrance, is rather low and rocky, with a small white rock close off it, and a reef extending a little over a cable. At 2 miles westward of Coyote Point a shelving rocky ledge, named *Las Galeras*, extends a quarter of a mile W.N.W. from a bluff point. About a mile farther westward is *Arranco Cabello Point*, a steep rocky projection, backed by a hill 164 ft. high; a small $1\frac{1}{2}$ -fathom shoal lies 3 cables north-westward of it, with $2\frac{3}{4}$ fathoms between.

Scout Shoal, with $1\frac{3}{4}$ fathom on its shoalest part, is a dangerous shoal, lying 11 cables N.W. $\frac{1}{2}$ N. from Arranco Cabello Point; it is about a quarter of a

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mile in diameter, the bottom consisting of loose stones. There is generally a can buoy on its N.W. side, but it cannot be depended on. On its South side is a passage a quarter of a mile wide, with 4 fathoms water.

San Lorenzo Reef, $1\frac{1}{4}$ mile N.N.W. of Scout Shoal, and about the same distance S.E. $\frac{1}{4}$ E. from *Lupona Point*, the S.E. point of *Espiritu Santo Island*, is a rocky ledge, 4 cables long N.W. and S.E., by $2\frac{1}{2}$ cables wide, with $4\frac{1}{2}$ feet least water, near the centre. *Suwanee Rocks* lie half a mile N.E. $\frac{1}{4}$ N. from the shoalest part of the reef; the patch is of small extent, with 1 foot least water at low tide, and 5 and 6 fathoms close around it.

The main channel, between Scout Shoal and San Lorenzo Reef, is three-quarters of a mile wide, with 5 to 8 fathoms water. To pass through it from the eastward, keep the North end of Ceralbo Island astern, bearing E. $\frac{3}{4}$ N., which will lead nearly midway between the dangers, and when Lobos Rock is open of Diablo Point, the latter bearing S. $\frac{1}{4}$ W., all danger will be past. If the North end of Ceralbo cannot be made out, steer to pass about three-quarters of a mile off Coyote Point, and, when past it, steer W. by N. for Dispensa Point, the S.W. extremity of *Espiritu Santo*, until Arranco Cabello Point bears S.W. by S. $\frac{1}{4}$ S., when steer W. $\frac{3}{4}$ S. until Lobos Rock is open of Diablo Point. When the hill behind Arranco Cabello Point bears S. by E., it is advisable to verify your position by a bearing of Dispensa Point.

Between San Lorenzo Reef and Lupona Point there is a clear passage, three-quarters of a mile wide, through which 4 fathoms may be carried. In hazy weather, or when night is coming on, vessels coming from the eastward around the North end of Ceralbo should make for this northern channel. To pass through it, steer for the South end of *Espiritu Santo*, until Tanner's Hill, 575 feet high, the first hill North of Lupona Point, is made out, when steer for it on any bearing between W.S.W. and N.W. by W. $\frac{1}{2}$ W., until Bonanza and Lobos Points are in range N. by E., when haul to the southward, steering S. by W., and keeping the points in range, until Lobos Rock is well open of Diablo Point.

To pass through the main channel from the westward, bring Bonanza and Lobos Points in range N. by E., and steer for them till Ballenas Island is shut in by Dispensa Point, the latter bearing N.W. $\frac{1}{2}$ W., when steer E. $\frac{3}{4}$ N. for the North end of Ceralbo Island. To pass through the North channel, continue the course N. by E. till Lupona Point bears W. $\frac{3}{4}$ S., when you may steer E. $\frac{3}{4}$ N.

For vessels not drawing over 21 ft. the North channel seems to be the safer, but that South of Scout Shoal should not be attempted except in case of necessity. During the greater part of the year the winds in the channel are regular, blowing from the N.W. from 9 a.m. till 4 p.m., succeeded by a southerly wind, which lasts all night.

Between Coyote Point and Gorda Point, $16\frac{1}{2}$ miles to S.E. by E., the coast is bold and rocky with occasional sand beaches, backed by broken and mountainous

country. At half a mile south-eastward of Coyote Point is a bold, rocky bluff, with moderately high hills, which has frequently been mistaken for the point. At $5\frac{1}{2}$ miles farther on is a rocky bluff, backed by a conspicuous hill 984 ft. high, the N.W. point of *Rosario Bay*. At the bottom of this open bay, which is formed between the bluff and *Point Santa Cruz*, about 2 miles to the S.E., is a ranch, just North of which a shoal extends a short distance off. A large white rock and several small ones lie off *Point Santa Cruz*.

At $3\frac{1}{2}$ miles beyond *Point Santa Cruz* is a rocky point, off which a reef extends nearly a quarter of a mile; fresh water may be obtained near this point. At 2 miles farther to the S.E. is *Point La Luz*, $2\frac{1}{2}$ miles S.E. of which is *Gorda Point*, a bold rocky bluff, 50 to 75 ft. high, the N.W. limit of *Ventana Bay*.

Ventana Bay is a large open bay, $12\frac{1}{2}$ miles wide between *Point Gorda* and *Point Arena de la Ventana* to the E. by S., and 6 miles deep, much frequented by pearl-fishing vessels. There is anchorage in 5 to 8 fathoms at half a mile off shore in any part of the bay. The South shore is low and sandy, but on the N.W. side the hills rise more abruptly, with some high peaks in the interior. *Los Cacachiles*, the two highest peaks, are over 4,000 ft. high; they lie $7\frac{1}{2}$ miles to the S.W. of *Gorda Point*, and are a mile apart, being visible from a great distance.

At $9\frac{1}{2}$ miles westward of *Point Arena* is the small village of *La Ventana*, lying near the shore of the bay; there is a road from here to the *Triunfo* silver mines, about 15 miles distant, but the silver is shipped at *La Paz*. Fresh water, cattle, hogs, poultry, vegetables, &c., may be obtained here.

Point Arena de la Ventana, low and sandy, should not be approached within half a mile, 6 fathoms being found at that distance. In moderate weather anchorage may be obtained inside the point, in 6 to 8 fathoms, sand, the tide rises about $4\frac{1}{2}$ ft. From hence the coast continues low and sandy to *Perico Point*, $2\frac{1}{2}$ miles to S.E. by S.; the latter is a steep, white, rocky bluff, 40 to 60 ft. high, backed by an abrupt hill, 797 ft. high. At about 2 miles to the S. by W. of the point is a small cove, the coast between being similar to the point.

CERALBO ISLAND, lying $3\frac{1}{2}$ miles to the northward of *Point Arena de la Ventana*, is high and barren, $15\frac{1}{2}$ miles long N.W. and S.E., and from 1 to 4 miles wide. It is said to contain rich copper mines. In the northern part of the island is a peak, 2,265 ft. high, and another in the southern part 2,477 ft. high. The eastern side of *Ceralbo* is a succession of bold, rocky bluffs and gravel beaches, with deep water close-to. A reef extends nearly half a mile off the North point, and small vessels, especially those engaged in the pearl fishery, frequently anchor close eastward of the point, somewhat protected from strong N.W. winds.

Seal Rock, 4 miles N.W. $\frac{1}{2}$ N. from the North point, is about 100 ft. long and 12 ft. high, with a few smaller rocks in the vicinity forming a dangerous

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group. At less than 100 yards from its N.W. side is a rock awash at low water, and a cable to the S. by W. is a sunken one of 2 fathoms. The channel between these rocks and Ceralbo is believed to be free from dangers, though some were reported to exist before the time of the American survey.

The western shore of Ceralbo is similar to the eastern. A reef extends a short distance off the bluff N.W. point, and at $4\frac{1}{4}$ miles to the southward is a slight indentation, with a strip of sand beach at the bottom, known as *La Limona*; *El Mostrador* is a similar indentation 3 miles farther South, its South limit being *Farallones Blancos*, a steep, high, white bluff. At $2\frac{1}{4}$ miles farther southward is *Carrera de los Viejos*, a bold, rocky point, the next point southward of which is low and sandy, forming the S.W. extremity of the island. The water off the latter point is deep, but on its North side there is anchorage in 10 fathoms, 2 cables off shore. At three-quarters of a mile S.E. by E. of the S.W. point is *Piedra Gorda*, a bold, rocky point, with a reef extending about a quarter of a mile off it; from hence the S.E. point, a steep, rocky bluff, is a little over 3 miles distant.

Montana Rock, so named from a vessel which struck on it in 1874, is a dangerous rock, with only 4 ft. over it at low water, lying about three-quarters of a mile S.E. $\frac{1}{4}$ S. from the S.E. point of Ceralbo, with the eastern extreme bearing about N. by W., and *Piedra Gorda* W. $\frac{1}{2}$ N. There is a depth of 5 and 6 fathoms in the channel between.

In using the channel between Ceralbo Island and the land, it is only necessary to keep in mid-channel. In entering from the southward, you will pass well to the southward of *Montana Rock* by not bringing *Los Cacachiles* to bear anything to the southward of W. by S. With a head wind sailing vessels should not attempt to use the channel, as the tides sometimes run $2\frac{1}{2}$ knots per hour. Calms are also frequent, and as a rule sailing vessels bound to *La Paz* will do better to go well outside of Ceralbo Island. Unless well acquainted with the coast, it is not advisable to use the channel at night or in thick weather.

Muertos Bay is formed by the receding of the coast between *Perico Point* and *Pescaderos Point*, a bold, red, rocky point, 15 miles to S.E. by S. $\frac{1}{4}$ S. The land at the back of the bay rises to a height of nearly 4,000 ft., the most prominent peak, 3,768 ft. high, lying 9 miles W by N. from *Pescaderos Point*. In the northern part of the bay the water is deep close to the broken rocky shore, but in the southern part there is anchorage in 6 to 10 fathoms, sand, half a mile off the sandy beach. There are several ranches near the shore.

Palmas Bay, very similar to *Muertos Bay*, is formed between *Pescaderos* and *Arena Point* a low, sandy point, $19\frac{1}{4}$ miles to S.E. by E. It is entirely open to the East, and affords no shelter from S.E. gales. In the northern part the coast consists of rocky cliffs and stony beaches, with deep water close-to,

but the southern part is low and sandy, and a depth of 3 to 5 fathoms, with indications of shifting shoaler spots, is found at half a mile off between Arena Point and a steep rocky point $3\frac{1}{2}$ miles north-westward of it. Several arroyos, or streams, open into the bay, and there are several ranches near the shore. At $2\frac{1}{2}$ miles southward of Pescaderos Point are the ruins of a stone building, and at $9\frac{1}{2}$ miles farther on is *Boca Trinidad*, with an extensive ranch near it.

Arena Point has deep water off it, but a heavy surf breaks around it. Inland is a plain covered with cactus, bushes, and trees, among which the copal tree is found. In moderate weather there is good anchorage in 7 to 10 fathoms, sand, at 1 mile S. by W. $\frac{1}{4}$ W. from the point, and less than half a mile off shore. The tide rises about $4\frac{1}{2}$ feet.

Between Arena Point and High Bluff, 7 miles to S.E. by S. $\frac{1}{2}$ S., the coast forms an open bay $1\frac{1}{2}$ mile deep, with a sandy shore. *High Bluff* is a rocky headland, 50 to 75 ft. high, surmounted by a hill 820 ft. high; shoal water extends a short distance around it, with numerous detached rocks close to. At $1\frac{1}{2}$ mile N.W. by N. $\frac{1}{4}$ N. from it, and 4 cables off shore, is a small breaking shoal, with 4 to 5 fathoms between it and the shore. Cape Pulmo, well open of High Bluff, and bearing nothing eastward of S. $\frac{1}{4}$ E., leads clear of it. Just to the South of High Bluff is a small settlement of pearl fishers.

Cape Pulmo is a gray, bold, rocky bluff, 410 ft. high, surmounted by a hill 850 ft. high, 4 miles southward of High Bluff, the coast between consisting chiefly of sand bluffs about 20 ft. high, with a few outlying rocks. At $1\frac{1}{2}$ mile northward of the cape, and about one-third of a mile off shore, is a small white rock, 12 ft. high. At 7 or 8 miles to the north-westward are some abandoned silver mines. On the South side of the cape is a small bay, with 10 fathoms within a cable's length of the beach; at its head is a stream and a ranch. The sea breaks for a quarter of a mile off the S.E. point.

Between Cape Pulmo and Gorda Point, 21 miles to S. by W. $\frac{3}{4}$ W., the coast is moderately low and rocky, with occasional sand beaches, sloping gradually to the mountains. At 8 miles southward of Cape Pulmo is *Porfia Point*, a bold, rocky bluff 60 ft. high, with numerous rocks close off it; it may be recognised by its light gray colour. About 3 miles northward of it is a rocky bluff, 60 ft. high, an arroyo and a ranch lying about midway between. At 10 miles S.S.W. of Porfia Point is *Polfia Point*, low and rocky, with a surf always breaking on it. About midway between the water is shoal and discoloured for a mile or more off shore; at a mile off the depth was 12 fathoms.

Gorda Point, 3 miles S.W. of Polfia Point, is a round, rocky bluff about 50 ft. high, with many rocks close off it; a rather flat-topped hill rises from to a height of 300 ft. At $1\frac{1}{2}$ to 2 miles West of the point, and near the shore, are the *Cerros Prietos*, a cluster of conspicuous hills of a conical shape and light gray colour, resembling small craters; they are distinguishable at a considerable distance.

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SAN JOSE DEL CABO BAY * is formed between Gorda Point and Palmia Point, $8\frac{1}{2}$ miles to S.W., the shore consisting of steep sand beaches, on which the sea breaks heavily, with rocky patches at either end. There are moderately high hills a short distance inland, with the mountains of San Lazaro to the North and West. The bay is entirely exposed from N.E. to S.S.W., by the East and South, and is very dangerous, when, in bad weather, the winds prevail from this quarter; the bottom being bad holding ground, and the anchorage so near the shore, that there is no chance of getting off with the wind on shore. It follows, therefore, that this bay ought not to be frequented, except from the end of November until May, the season when winds from West and N.W., and fine weather, prevail throughout the gulf, as well as on all the Mexican coast. It is at this period that it is visited by the whalers and merchantmen trading to Lower California; but the latter prefer the port of La Paz, before described, which is more secure.

Vessels may anchor anywhere at one-third of a mile from the beach in from 7 to 9 fathoms, sand, except just South of the watering-place, which is $3\frac{1}{2}$ miles N.E. by N. $\frac{1}{4}$ N. of Palmia Point, where there is a deep hole, with from 30 to 50 fathoms to within 2 cables of the shore. The best anchorage is in 8 to 9 fathoms, about three-quarters of a mile northward of Palmia Point, abreast a short strip of sand beach, where there is the best landing for boats. Landing in ordinary ship's boats is always dangerous on account of the heavy swell. The tide rises about 4 feet.

At a little over 3 miles N.N.W. from Palmia Point is the mouth of *San José River*, which rises many miles in the interior, and flows through an extensive, fertile, and well cultivated valley. The river only breaks through the sand ridge at its mouth at the time of freshets, but at a mile farther to the eastward is a small outlet, always open, where good water may be obtained at the last of the ebb; *Mount San Lazaro*, 4,564 ft. high, the highest peak of the range, bearing N.W. by W., leads to the watering-place.

The village of San José del Cabo is on the western bank of the river, three-quarters of a mile from the sea, and here supplies of fresh meat, vegetables, and wood, may be obtained at moderate prices. The population is variously estimated at from 1,000 to 1,500, the business of the place being mainly dependent on the silver mines of San Antonio or Triunfo, with which it is connected by a road. Shark oil is also made here; the castor bean grows wild, and there is plenty of cedar and rose-wood on the mountains. An extensive salt marsh, named *Salutea*, lies between the town and the beach. Horses may be obtained from the natives near the watering-place, for riding to the

* At the mission of San José, in the southern part of the peninsula, the learned Abbé Chappe d'Auteroche died, whom the Royal Academy of Sciences sent to observe the transit of Venus in 1769. He accurately determined the position of Cape San Lucas, which served as a landfall and departure for the ships for China and Europe.

village, where persons wishing to go overland to the mines of La Paz may procure horses and mules for the journey, which is somewhat over 100 miles.

This bay was visited by H.M.S. *Herald*, in June, 1848, and Capt. Henry Trollope, R.N., thus describes it.

The Bay of San José is an indifferent roadstead at the extreme of the Californian Peninsula. It is entirely exposed from N.E. by the East to S.S.W.; the water is deep even close to the shore, and a hole having 40 or 50 fathoms exists in the best part. It is, however, a convenient place for obtaining water, as well as for fresh beef and vegetables. Fruit, such as figs and oranges, milk, Mexican cheese, and one or two other articles may be procured from the village. One of the marks for the bay will be the high range of hills running to the N.W.; the remarkable thumb-peak of San Lazaro standing up like a pinnacle is the highest of the range, while the valley of the river is clearly defined between this range on the left and a much lower range of pinnacles, craters, and flat table-lands on the right.

Running along the coast from the eastward, Punta Gorda (the northernmost point of the bay) is too remarkable to escape notice—a flat white hill of moderate height, perhaps 150 or 180 ft. high, with several pyramidal hills to the left, particularly a group of three in one with a flat-topped crater-like hill or truncated cone near it, and a flat level plain with a conical hill in it to the right; the long playa, or sandy beach, will then be seen, running along which you will soon distinguish the stream and a flagstaff on a slightly elevated mound. The coast may in any part be approached without danger, having 5 or 6 fathoms close-to, but deepening very rapidly. To avoid letting go your anchor in the 50-fathoms hole, keep the flagstaff open to the westward of the high peak of San Lazaro, or thumb, as we call it, the latter bearing N.W. by W., when a vessel may anchor in 13 to 15 fathoms, soft mud, three-quarters of a mile from the shore.

The river is 50 yards to the left of the flagstaff, and at low water, when there is but little surf on the beach, affords an excellent supply. It is, however, liable to interruptions; strong N.W. breezes raise a heavy surf on the beach, rendering landing somewhat difficult. However, with a party on shore filling and a hauling-line for the casks, we completed very expeditiously, getting forty tons on board in thirty hours. The sea at high water percolates through the sand, rendering the water brackish and unfit for use. This can be remedied by going higher up the stream, but the labour is of course more. Horses are good and easily obtained. There are no remains of the Franciscan Mission of San José, the origin of the place.

Palmia Point, the S.W. extremity of San José Bay, is a low, bluff, rocky point, with numerous rocks close off it, backed by a mound 353 ft. high. At 1½ mile off this part of the coast no bottom was found at 100 fathoms. *Cerro Colorado*, near the point and at half mile from the beach, is of red sandstone,

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502 ft. high, an excellent landmark, there being no other like it between San José and San Lucas Bays.

For about $1\frac{1}{2}$ mile S.W. by S. of Palmia Point the coast is rocky, and then for a distance of $2\frac{1}{2}$ miles it is low and sandy, as far as a stream and several ranches. For 4 miles farther to the S.W. it is generally rocky and of moderate height to *Cabeza Ballena*, a perpendicular rocky point of a dark lead colour, from 50 to 75 ft. high, with numerous detached rocks off it. The rocky coast continues for 2 miles farther westward, where it joins the steep sand beach of San Lucas Bay.

CAPE SAN LUCAS, at the southern extremity of the peninsula, gradually, though not very regularly, descends from the very broken and uneven range of mountains which extends from the N.W., and terminates in its South extremity in a hummock of low, or very moderately elevated, land, of a rocky, sterile appearance. At three-quarters of a mile West of the cape is a gap in the hills, where a strip of sand beach, a cable wide, extends through to San Lucas Bay. From this beach to the cape there is a wedge-shaped mass of steep, rocky hills, the highest of which, named *Figia Hill*, is 527 ft. high.

Los Frailes are two high, rugged rocks, with numerous smaller ones near them; the western one, connected with the wedge-shaped ridge by a narrow strip of low sand beach, is 303 ft. high, of sugar-loaf shape, with an archway on its eastern side, through which the sea rushes with great force. The eastern rock is 251 ft. high, very steep, and is the Cape San Lucas proper, being in lat. $22^{\circ} 52' 30''$ N., long. $109^{\circ} 54'$ W. A large low rock lies about 100 ft. eastward of it. They are covered with white guano.

San Lucas Bay, lying northward and eastward of the cape, is about $3\frac{1}{2}$ miles wide between the cape and *Cabeza Ballena* to the N.E., and affords good shelter from north-westerly winds, but is exposed to the sea from South around to East, rendering it an exceedingly unsafe anchorage during the wet season, when S.E. gales are both frequent and heavy.

The soundings are very irregular, and the anchorage, by reason of its great depth in the centre, is completely a lee shore. The best anchorage is in the N.W. part, in 6 or 7 fathoms, a quarter of a mile from the beach. At less than a quarter of a mile N. by E. $\frac{1}{2}$ E. of the cape, a depth of 213 fathoms, rocky bottom, was found. After passing the *Frailes*, which may be approached close-to, steer about N.W. by N. for *Richie's house*, a large white house of two stories, the first object seen in making the anchorage. Keep the lead going, and be ready to let go the anchor, at a moment's warning, in 6 to 12 fathoms, but be sure to have the lead on the bottom when the anchor is let go, as the bank is very steep. The best landing is at the S.W. part of the bay, where the sand beach joins the high headland. It is high water, on full and change, at $8^h 28^m$; the tide rises 4 feet.

The village of San Lucas, on a plain behind the sand-hills, consists of about

North Pacific.

a dozen houses and numerous huts; the population, numbering about 150, are chiefly engaged in raising cattle. A custom-house has recently been established. Excellent fresh beef, vegetables and fruit, can be obtained at moderate prices; fresh water, of fair quality, is abundant, the best being found in wells in the bed of an arroyo, about half a mile from the beach. Wood can also be obtained, and there is plenty of game in the vicinity; countless numbers of turtle doves fill the woods. A road along the beach connects San Lucas with San José, about 16 miles distant.

The village consisted of four houses at the time of Capt. Sir Edward Belcher's visit, and water, wood, cattle, cheese, oranges, and pumpkins were obtained. The water, which is procured from wells, is sweet when drawn, and very bright, but is impregnated with muriate of soda and nitre, which pervade the soil. It consequently soon putrefies on board. The country about Cape San Lucas is mountainous, and probably granitic. The plains, as well as the hills, are very abundant in cacti.

The navigator has no hidden dangers to fear; all are above water. After rounding the Frailes from the westward, he may safely stand for the houses, dropping his anchor in 15 fathoms. The bad season is supposed to commence in June, and terminates on the 1st of November.

A word of caution in anchoring here may be given. The *Sulphur*, on shortening sail in coming to, had 10 fathoms, and immediately after they had no bottom with 88 fathoms, just as they were about letting go the anchor. This shows the necessity of keeping the lead on the bottom before letting go an anchor, or you may lose it.

The West Coast of Lower California.—With the exception of Todos Santos and Santo Tomas, the entire West coast of the peninsula of Lower California is barren in the extreme. The land is generally high and precipitous, and its approaches bold, but there are many places where vessels may find sheltered anchorage from the prevailing winds.

Winds.—Along this coast north-westerly winds blow steadily for eight months of the year; from November to February, inclusive, winds from S.E. to S.W. are frequent, with occasional moderate S.E. gales, accompanied with considerable rain. At the breaking up of these gales the wind hauls to the S.W., sometimes blowing quite hard for a few hours, and then comes from the N.W. with fine weather. Heavy northers, blowing from North to N.E. for one to three days, are liable to occur in December and January. Near Cape San Lucas, short but strong S.E. gales occur during the summer months, sometimes extending as far North as Magdalena Bay.

The weather is clear and pleasant during the greater part of the year, and the climate healthy and equable. Rain is most frequent between May and October, but fog occurs at all seasons, chiefly during the summer, in the night or early morning. There is more fog North of Cerros Island than South of it.

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from half a knot to 1 knot per hour. At all times an easterly set should be guarded against. A very slight N.W. current has sometimes, though rarely, been found in the winter season.

The Coast between Cape San Lucas and the Island of Santa Margarita, a distance of 132 miles to N.W. by W. $\frac{1}{4}$ W., is in many parts composed of steep, white, rocky cliffs; the country rising with a very broken and uneven surface to the ridge of stupendous mountains previously mentioned, and which are visible at a great distance into the ocean. The shores jut out into small projecting points which terminate in abrupt cliffs, and, having less elevated land behind them, give them at first the appearance of being detached islands. The general face of the country is not very inviting, being destitute of trees and other vegetable productions.

The coast between Cape San Lucas and Cape Falso, $4\frac{1}{2}$ miles to W. $\frac{3}{4}$ S., is a succession of sand beaches and bold rocky bluffs, against which the sea always beats heavily. *Cape Falso* is a rocky bluff about 50 ft. high, with many rocks near the shore; the *Paps*, $1\frac{1}{2}$ mile North of the cape, is a double hill, 778 ft. high. From Cape Falso the coast trends 7 miles N.W. by W. $\frac{3}{4}$ W. to *Point San Cristobal*, a bold, rocky bluff, 75 ft. high; it chiefly consists of sand beaches, backed by white sand bluffs, 150 to 300 ft. high, covered with patches of low shrubs.

About 2 miles N.W. by N. of Point San Cristobal is a red, rocky bluff, with numerous rocks at its foot, and a ranch and arroyo close northward of it. At 2 $\frac{1}{2}$ miles farther on is *Cerro de la Playa*, a rocky bluff, 75 ft. high, backed by an abrupt conical hill, 1,114 ft. high. Between this and San Pedro Point, 2 $\frac{1}{2}$ miles to N.W. by N. $\frac{1}{2}$ N., the coast is a succession of sand beaches and rocky bluffs. *La Aguja*, the most prominent peak of the interior mountains, presents an almost perpendicular column, with a sharp point to the northward, isolated from and but little lower than the adjacent mountain, which is 5,924 ft. high. There is said to be a fresh-water lake near its summit, an unfailing supply for the numerous deer and other wild animals.

At about 2 $\frac{1}{2}$ miles northward of Cerro de la Playa are an arroyo and a ranch, 2 $\frac{1}{2}$ miles beyond which is *La Tinaja Point*, a bluff 75 ft. high, backed by an abrupt hill 596 ft. high. At 3 $\frac{1}{2}$ miles from the point is a conspicuous mountain, 2,183 ft. high, named *La Tinaja* (the pitcher), having a small lake of rain water near its summit. Between *La Tinaja Point* and *Point Casparino*, a bluff 75 ft. high, 8 $\frac{1}{2}$ miles distant, are two arroyos; the banks of the southern one are of yellow bluffs, and on the northern one is a small settlement with some palm trees.

Pescadores Bay lies between Point Casparino and a bluff point, on which is a high conical hill, 414 ft. high, 3 $\frac{1}{2}$ miles to the northward; there is a small fishing village half a mile from the beach. At 3 $\frac{1}{2}$ miles farther on a steep bluff commences, and extends for $1\frac{1}{2}$ mile to the N.W. About 2 miles farther on is San Pedro Point, and between lies *San Pedro Bay*, where landing is

said to be practicable in fine weather; at the back is a fertile valley, in which is a settlement. At three-quarters of a mile northward of San Pedro Point is Lobos Point, the N.W. point of the same promontory.

Todos Santos River, entering the sea about $1\frac{1}{2}$ mile northward of Lobos Point, flows through a fertile valley, and at 2 miles from its mouth is the village of Todos Santos, with 800 inhabitants, on the site of the old mission of *Santa Rosa*. Fruit, vegetables, and cereals, of both temperate and tropical climates, are raised here, and it is an excellent place to procure fresh provisions and water.

In moderate weather there is good anchorage in 7 to 10 fathoms, sand, one-third of a mile off shore, and about half a mile northward of Lobos Point, anchoring immediately after passing the range between Lobos and San Pedro Points. The tide rises about 4 ft. *Lobos Point* is the N.W. point of a high, rocky promontory, abruptly rising to a hill, 773 ft. high. The best landing is at a little cove, somewhat protected from the swell, about half a mile eastward of the point, and from hence there is a road to the village.

At 5 miles northward of Lobos Point is the *Arroyo de las Palmitas*, with palm groves at its mouth, and a beautiful valley extending inland.

From Lobos Point the coast, generally low, sandy, and barren, trends N.W. by W. $\frac{1}{2}$ W., 88 miles, to El Conejo Point; about halfway between is *Point del Marquis*, a low, rocky point, with a reef extending a short distance off it, the only rocky formation on this part of the coast. In about lat. 24° N., and from 5 to 10 miles inland, are some isolated table-hills, 600 to 800 ft. high, called *Las Mesas de Narva*. In fine weather vessels may anchor anywhere along this coast in 8 to 10 fathoms, a mile or two from the beach. The land being low the lead should be frequently used, especially at night or in thick weather, the soundings being regular.

The country between Marquis Point and La Paz Bay, about 25 miles to the N.E., is low and flat for nearly the entire distance, with a scanty growth of bushes and cactus.

The **GULF of MAGDALENA** is an extensive inland sea, whose existence was scarcely suspected in Europe prior to the visit of Capt. Sir E. Belcher, in 1839, when he minutely surveyed it. Nearly at the same time the French frigate *La Venus*, under Du Petit Thouars, also surveyed its shores, and his plan, much less elaborate than that of our English hydrographers, forms a portion of the atlas accompanying the voyage. It may properly be said to consist of two extensive bays. Almejas Bay to the S.E., and Magdalena Bay, the principal, to the N.W. With the following description is incorporated the information obtained by the officers of the U.S.S. *Narragansett*, in 1874.

SANTA MARGARITA ISLAND, which forms the seaward face of the greater part of these two bays, is a high, barren island about 22 miles in length, by 1 to 4 miles in breadth. In its centre it is so low, that at a distance it might be taken for two separate islands, the northern and southern portions

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being high land. Two species of tortoise are found on the island, one of which is very good eating, but the shell is worthless; the other, on the contrary, is unfit for food, but the shell is excellent and valuable.

Cape Tosco, the S.E. point of the island, is a sharp, bold, rocky point, with a reef extending about 3 cables south-eastward of it, over which the sea breaks violently. A tolerably good anchorage may be found eastward of the point, under its lee, in 7 to 9 fathoms. *Mount Santa Margarita*, 4 miles N.N.W. of the point, is 1,898 high.

At $3\frac{3}{4}$ miles N.E. by N. $\frac{3}{4}$ N. of Cape Tosco is *Santa Marina Point*, the S.W. point of *Cresciente Island*, a low sand island about 10 miles long East and West. Opposite the eastern end of the island is *El Conejo Point*, before mentioned, a low point backed to the North by a mound 50 ft. high, and separated from it by a narrow arm of a lagoon extending to the eastward.

Between Cape Tosco and Santa Marina Point is the southern and intricate entrance to the two bays, through *Rehusa Channel*, only fit for boats. The tide runs very strongly through this narrow channel, which is much embarrassed by sandy patches nearly and quite awash. No instructions can therefore be given for this, and will be scarcely ever required.

ALMEJAS or LEE BAY is about 12 miles in extent to the N.W., and 7 miles wide, and is divided from Magdalena Bay by *Marcy Channel*, a narrow but clear and deep channel, formed by a sandy projection from the main land on the N.E. The extremity of this is called *Lengua (Tongue) Point*, and connected with it is an extensive low island, named *Mangrove Island*. The channel has an average width of about a mile between the shoals, the depth varying from 6 to 17 fathoms.

Southward of this sandy tract, the island of Santa Margarita is divided into two separate tracts of mountainous land by a low sandy neck, $1\frac{1}{4}$ mile wide. From the chart these points would seem to be the effect of currents, probably in combination with the geological changes hereafter noticed.

The North side of Santa Margarita Island, from this strait, trends nearly West, true, to its N.W. point, Cape Redondo, and about midway between its extremities, on the seaward face, is *Pequena Bay*, lying against the low tract previously mentioned; *Cape Judae* forms its N.W. extremity. A short distance S.E. of the bay are the *Sisters*, two remarkable peaks over 1,000 ft. high, and about the same distance to the N.W. is a prominent, white, bluff point, 200 ft. high, with a reef and some outlying rocks above water.

MAGDALENA BAY, a most safe and spacious harbour, is about 15 miles long N.W. and S.E., and 12 miles wide. On its northern side the country is low and sandy, with low bushes and cactus, and on the shore are numerous small lagoons, and shoal water extends 1 to 2 miles off. At its N.W. end it is connected with a series of lagoons, extending upwards of 60 miles in a northerly direction; the depth in the channels leading to them varies from 4 to 8 fathoms, and whaling vessels have ascended them for a distance of

40 miles. Orchilla is gathered and shipped to San Francisco; fish is abundant, and there is plenty of game on the North shore. Vast numbers of shrimps sometimes appear, giving the water a crimson colour. Both this and Almejas Bay were formerly much resorted to by whalers in the winter months; vast numbers of whales were taken, chiefly in the latter bay.

The entrance to Magdalena Bay lies between Cape Redondo and Entrada Point. *Cape Redondo*, the West point of Santa Margarita Island, is a round rocky headland, nearly 100 ft. high, with a reef extending 3 cables westward of it, its outer limit marked by a rock awash. The sea breaks over this reef; but for two hours, on one occasion when the water was smooth, Lieut. Tanner observed no break on the outer rock at the last of the flood and the first of the ebb. He also observed a heavy overfall, at the beginning of the flood, at least 2 cables from the extremity of the reef, which may account for the reported rock near the middle of the channel. *Entrada Point* is a dome-shaped hill, about 200 ft. high, connected with the main land by a low and narrow strip of sand and rock; several rocks, 10 to 20 ft. high, lie near it, and a reef extends about $1\frac{1}{2}$ cable to the S.E., over which the sea generally breaks.

The channel between these reefs is $2\frac{1}{2}$ miles wide, with 10 to 20 fathoms water. In entering, a sailing vessel should keep well over toward Entrada Point, as the prevailing wind and current tend to set her toward Cape Redondo. The tidal currents here run from 1 to 2 knots per hour. To reach the best anchorage keep about three-quarters of a mile from the land, north-westward of Entrada Point, to Man-of-War Cove, and anchor in 8 to 10 fathoms, abreast of some houses near the beach, $7\frac{1}{2}$ miles from Entrada Point.

Man-of-War Cove is situated at the N.W. extremity of Magdalena Bay; the settlement is on the West side, and consisted of about ten houses in 1874, one used as a custom-house, and the others chiefly occupied by men engaged in collecting and shipping orchilla. It is connected with La Paz, 115 miles distant, by a rough trail. It is high water here, on full and change, at 8^h 25^m; springs rise $5\frac{1}{2}$ ft., neaps 4 feet.

Light.—A *fixed bright* lantern light, visible 6 miles, is shown on the shore of the cove; vessels approaching at night should steer for it bearing W.N.W., and anchor as convenient in about 6 fathoms.

In summer fresh water is brought to the settlement by small vessels, which obtain it near one of the northern lagoons, about 40 miles from the bay. The watering places on the shores of the bay only furnish inferior water, obtained by sinking a cask in the sand. There is said to be a spring of excellent water near the southern end of Santa Margarita Island. Plenty of wood may be procured from the mangroves around the lagoons.

Having rounded Point Entrada, half a mile distant, haul up along the land to the westward. Mount Isabel is the first high land after entering, and when that is abeam the sand-spit running off from the low point 3 miles inside Point Entrada, is abaft the beam, and you can haul up in safety for Cove

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Point. You cannot fail to make Cove Point distinct from the land back of it. Run close to it, and follow to the anchorage, which is directly off the houses. Anchor in 8 or 9 fathoms, one-third of a mile from the beach.—*Capt. W. H. Parker, P.M.S.S. Co.*

Mount Isabel, 1,592 ft. high, lies $3\frac{1}{2}$ miles N.W. by W. of Entrada Point, the southern point of San Lazaro peninsula. At the foot of Mount Isabel, within the bay, a fresh-water marsh is marked on the chart, 3 miles within the entrance point. Five miles farther on, on the N.E. face of the peninsula, and near to where the high land sinks to the long sandy neck connected with it northward, is the anchorage under Delgada Point, now known as Man-of-War Cove; here Capt. Belcher established his observatory, in lat. $24^{\circ} 38' 18''$ N., long. $112^{\circ} 6' 21''$ W., at the foot of a hill 600 ft. in height, according to M. de Tesson's chart. According to the U.S. surveyors, the observation spot at Man-of-War Cove is in lat. $24^{\circ} 38' 22''$ N., long. $112^{\circ} 8' 50''$ W.

Northward of this the bay becomes very shallow, but has some deeper channels extending northward, separated by extensive shoals, which have received the names of *Du Petit Thouars*, *Tesson*, and *La Venus*, the French surveyors and their ship. As there can be no inducement whatever for entering them, no further notice here is necessary.

In winter, with southerly winds, there is good anchorage in the southern part of the bay; the chart is a sufficient guide, keeping the lead carefully attended.

In the account of his exploration, Captain Sir Edward Belcher gives the following description of his progress:—

I was fully prepared to have found, as the name imported, an extensive bay, but on entering the heads, which are about 2 miles asunder, no land could be discerned from the deck, from N.W. to N.E. or East; and even after entering, it was quite a problem, in this new sea, where to seek for anchorage, our depths at first, even near the shore, ranging from 17 to 30 fathoms. However, as the prevailing winds appeared to be westerly, I determined on beating to windward, in which it eventually proved I was correct. About 4 p.m. we reached a very convenient berth in 10 fathoms, with a very sheltered position for our observatory. Preparations were immediately made for the examination of this extensive sea, or what I shall in future term the Gulf of Magdalena.

It is probable that this part of the coast formerly presented three detached islands, viz., St. Lazarus range, Magdalena range, and Margarita range, with one unnamed sand island, and numerous sand islets.

The first part of our expedition led us up the northern branch of what held out some prospect of a fresh-water river, particularly as frequent marks of cattle were noticed. In the prosecution of this part of our survey, we noticed that the St. Lazarus range is only connected by a very narrow belt of sand between the two bays, and that the summits of some of these sand-hills were covered in a most extraordinary manner by piles of fragile shells, which resembled those

found recently in the gulf. At elevations of 50 and 60 ft. these minute and fragile shells were found *perfect*; but on the beaches, either seaward or within, not a shell was visible. This is the more extraordinary, as these sandy wastes are constantly in motion, and drowning everything else, and yet these shells are always exposed. On digging beneath them to erect marks no beds of shells occurred, nothing but plain sand. It was further remarkable, that they appeared to be collected in families, principally area, venus, cardium, and murex; when ostrea appeared they were by themselves.

The cliffs throughout the gulf abound in organic remains, and I cannot but believe that the same cause has produced the above unaccountable phenomena, which I witnessed throughout a range of at least 90 miles.

Having explored the westernmost estuary, about 17 miles North of our observatory, until no end appeared of its intricacies, I resolved on attempting a second, which afforded a wider entrance, about 4 miles beyond the last, and it still offered ample scope for employment, the advance boats being at that moment in 4 fathoms, and distant heads in view; but finding no hope of reaching fresh water, I determined on adhering to its main outlines.

By November 9th (1839), we had reached the East end of the first gulf, and found the channel or strait connecting them not more than a quarter of a mile wide. I was sanguine in expecting that we should discover a safe channel out by the East end of Margarita, but I found that our boats, and, upon emergency, the *Starling*, might have passed out, but it was far too difficult and doubtful for the ship.

We had frequently seen, indistinctly, the outlines of very high mountains, to the eastward, distant 50 or 60 miles; but on this day I could detect breaks which indicated water-courses between them, and could plainly follow out yellow breaks of cliffs as far as the eye could trace inland. I have not the slightest doubt that these estuaries flow past them, and probably to the very base of the most distant mountain.

For all the time expended (18 days) on this immense sheet of water, it was naturally be enquired, what advantages does the port offer? The reply is, at the present moment, shelter; and from several water-courses, which were nearly dry at the time of our visit, it is evident that very powerful streams scour the valleys in the winter season, which, in this region, is reckoned between May and October. Fuel can be easily obtained in the estuary (mangrove).

As a port for refit after any disaster it is also very convenient; and for this purpose either our northern or southern observatory bays may be selected. The latter would afford better shelter; but the former is certainly more convenient, the access to it being entirely free from shoals.

In war it would be a most eligible rendezvous, particularly if watching the coasts of Mexico or California, as no one could prevent the formation of an establishment without adequate naval force, and the nature of the country it

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self would not maintain an opposing party. The island of Margarita would afford an excellent site for a deposit for naval stores. Martello towers on the heads of entrance would completely command it, and, excepting on the outside, no force could be landed.

Water would doubtless flow into wells, of which we had proof in spots where the wild beasts had scraped holes; but from some (no doubt removable) causes, it was intensely bitter. There is nothing in the geological constitution of the hills to render it so.

The ranges of hills composing the three suites of mountains vary from 1,500 to 2,000 ft.

From Entrada Point to Cape Corso, which is at the North end of the elevated part of the peninsula, the distance is 10 miles to N.W. by W., the breadth of the peninsula being here, on an average, about 2 miles. The coast is a succession of rocky points and sand beaches, with numerous rocks close to the shore. *Cape Corso* is a bold rocky point, fronted by white sand bluffs 70 to 80 ft. high, upon which dark-coloured hills rise abruptly to 600 ft. and upwards.

Santa Maria Bay is comprised between Cape Corso and the S.E. point of Cape San Lazaro, $7\frac{1}{2}$ miles to the N.W., being $4\frac{1}{2}$ miles deep within this line. The shore is a low sand beach, separated from the mainland by the entrance channels to the lagoons North of Magdalena Bay. The soundings are very regular, and there is good anchorage in 5 to 8 fathoms, sand, from a half to three-quarters of a mile off the western shore, well protected from the prevailing winds. Fish is abundant in the bay.

Cape San Lazaro is a remarkable high headland, of volcanic origin, which can be seen for many miles, appearing like an island at a distance. There are many bold rocky cliffs about it, and high rugged mountains close behind it, the highest 1,270 ft. long. Rocks extend a quarter of a mile off the N.W. and S.E. points of the headland. From the cape the coast trends about $3\frac{1}{4}$ miles S.E. to a low rocky point, from which it turns abruptly North for 2 miles to a small lagoon, at the North end of Santa Maria Bay.

ALIJOS ROCKS, or *Farallones Rocks*, a cluster of four high, detached, and remarkable rocks, lie about 192 miles W. $\frac{1}{4}$ S. of Cape San Lazaro. They are in lat. $24^{\circ} 51' N.$, long. $115^{\circ} 47' W.$, according to Admiral Du Petit Thouars' determination, but later observations by the U.S. surveyors place the summit of the South rock in lat. $24^{\circ} 58' 6'' N.$, long. $115^{\circ} 44' 47'' W.$ They will be again noticed hereafter, but, from their dangerous character, they must be alluded to here.

Between Cape San Lazaro and Boea de Comandu, for a distance of 56 miles northward, is a series of lagoons lying nearly parallel to the coast, separated from the sea by a narrow strip of sand; they are connected with one another and are used by small coasting vessels. At the back of them, many miles in the

North Pacific.

interior, high land will be seen. The following description of the entrances to them is taken from the report of the officers of the U.S.S. *Narragansett*, 1874. The shoals and bars at the entrances are probably subject to occasional changes, making an examination necessary previous to attempting to enter. In moderate weather the channels are plainly marked by the smooth water between the lines of breakers. On the plains fronted by the lagoons there are many wells of good water.

Boca de Soledad, the southernmost and deepest of the three entrances to the lagoons, is 30 miles N. by E. of Cape San Lazaro; it is about half a mile wide, with a ridge of sand-hills on either side, 50 to 100 ft. high. A breaking shoal extends $1\frac{1}{2}$ mile northward and westward from its southern side. To enter, approach from the northward, keeping close to the line of breakers on the North side of the entrance, and the bar will be crossed in 9 ft. at low water, deepening to 5 to 8 fathoms between the points, where the tide runs from 4 to 5 knots, and rises about 5 ft.

Boca de San Domingo, $13\frac{1}{2}$ miles N. $\frac{3}{4}$ W. of Boca de Soledad, is three-quarters of a mile wide, with a shoal extending a mile off it. A conspicuous peak, 3,811 ft. high, and 50 miles distant, bearing E. by N., leads through the entrance between the breakers, but there is only $2\frac{1}{2}$ ft. on the bar at low water; the tide rises 5 ft.

Boca de las Animas, $9\frac{1}{2}$ miles N. by W. of Boca de San Domingo, and the northernmost entrance to the lagoons, is about three-quarters of a mile wide, with a breaking shoal extending half a mile off it. The best channel is on the South side, near the beach, with 3 ft. in it at low water.

Boca de Comandu, $7\frac{1}{2}$ miles N.N.W. of Boca de las Animas, is only open to the sea during the rainy season. Near its source, about 25 miles distant, is the ancient mission of *Comandu*, previously described on page 160. *Boca de la Purissima*, 7 miles farther to the N.N.W., is closed during the dry season, and flows through a narrow and very fertile valley. About 10 miles up is the old mission of *Purissima*, now a village of twenty or thirty houses, with about 250 inhabitants. All sorts of fruits, vegetables, &c., are easily raised here, and much mescal or pulque, the national drink of the Mexicans, is manufactured from the maguey or aloe.

To the N.W. of Boca de la Purissima, sand-hills, 100 to 200 ft. high, line the coast, with high table-lands and mountains farther inland, over which the high peaks of the Sierra de la Giganta are plainly visible.

San Juanico Point, 11 miles N.W. $\frac{3}{4}$ W. of Boca de la Purissima, is a sand bluff, about 50 ft. high, surrounded by a shoal which commences about $2\frac{1}{2}$ miles north-westward of it, and extends from a half to three-quarters of a mile off shore. About half a mile eastward of the point is the narrow entrance of *San Juanico Lagoon*, with about 3 ft. on the bar at low water. The lagoon extends about 6 miles to the North, and has an average depth of about 2 fathoms, with many shoals in its southern part. Small coasters, drawing 6 or

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7 ft., enter it at highest springs. Much orchilla is gathered near the shores. Vessels may anchor in 5 to 6 fathoms, south-eastward of the point, and about a mile off shore, with some protection from the coast wind. Not far from the shore is a sulphur spring. Abalones and other edible molluscs are found on the rocks. Several peaks, with perfectly flat tops, will be seen in the interior.

From San Juanico Point the coast trends 20 miles to the N.W., when it turns abruptly to the westward for about 3 miles, and then $1\frac{1}{2}$ mile to the southward to a rocky point with bluffs 15 to 30 ft. high, and a hill on it 85 ft. high; shoal water with rocky bottom, over which the sea breaks, extends about half a mile off the point. Vessels may find shelter from the prevailing wind by anchoring in *Pequena Bay*, north-eastward of the point, in 5 to 6 fathoms, at a mile off shore. About $9\frac{1}{2}$ miles farther to the W.N.W. is the entrance to a small lagoon, which can only be entered by small boats.

San Domingo Point, $3\frac{1}{2}$ miles W. by S. of the lagoon entrance, is a remarkable, dark, rocky cliff, 175 ft. high, the cliffs extending for several miles on either side of it. A reef extends a short distance S.W. of it, and the sea breaks on the rocks at its foot, making it dangerous to land except in very moderate weather. There is anchorage in 5 to 6 fathoms, eastward of the point, and half a mile off shore, affording some protection from the prevailing wind.

From the cliffs northward of San Domingo Point the coast trends 40 miles N.W. by W. $\frac{1}{4}$ W. to the entrance of San Ignacio Lagoon, and is low and sandy throughout the entire distance. For 32 miles south-eastward of the lagoon a narrow lagoon lies parallel to the shore, separated from the sea by a sand beach, about a mile wide, through which are several narrow and shallow passages, with extensive shoals off them, which can only be crossed by boats in smooth weather. The lead is a good guide off this low shore, the soundings increasing gradually from the beach.

BALLENAS BAY, comprised between the West end of a low sand island off the entrance to San Ignacio Lagoon and *Alrejos Point*, 16 miles to W. by S. $\frac{1}{4}$ S., is entirely open to the South. The soundings in the bay are quite regular, and extend a long way off shore, gradually decreasing to 3 fathoms, within a mile of the low sandy beach, except off the entrances to the lagoons. With the strong coast winds a heavy swell sets in which causes a high surf along its shores. Whales of the "humpback" species formerly made this a favourite feeding-ground, on account of the myriads of small fish found here. In the fine season, countless flocks of pelicans are seen making awkward plunges to catch their swimming food.

San Ignacio Lagoon is a large sheet of water, extending about 20 miles to the northward, with extensive shoals, partly uncovered at low water, off its entrance. The channel is very narrow and tortuous, with 9 to 13 ft. in it at low water, but is clearly marked by the breakers on either side. It is said to be extremely dangerous, on account of the strong currents running in different

directions at different stages of the tide. A heavy swell usually rolls on the bar at full and change of the moon. Vessels drawing 12 ft. may cross the bar at ordinary high tides, the water deepening to from 3 to 7 fathoms inside. Large numbers of whales were formerly found here. In moderate weather there is good anchorage in 4 to 5 fathoms, with Point San Ignacio, on the West side of the entrance, bearing N.E., distant 3 miles. In clear weather the high peaks of Las Tres Virgenes are plainly visible.

San Ignacio, or Ballenas Lagoon, was first seen in 1857 by Capt. Pool, of the whaling barque *Sarah Warren*, and in 1859 a whaling fleet first entered it.

The main branch of the lagoon is 2 miles wide at its mouth; running North for 3 miles, it then turns a little to the West, and doubles its width 6 miles from the bar. A small branch, making from the South part of the entrance, and taking a more easterly course, runs through a low flat country.

Near the head of this sheet of water are two islands, not over 2 miles in length, and 1 mile in width. Both are very low. The upper island, on its highest part, has a growth of trees and low bushes, which gives it a pleasant contrast with the surrounding country. The southern island is quite barren; flocks of grey gulls, pelicans, and cormorants, literally covered its shell beaches. Around the shores large numbers of huge turtle lay sleeping, and shoals of cow-fish and porpoises played.

The face of the country, immediately in the vicinity of this inland water, on either hand, is low, quite level, and extremely barren. To the south-eastward rises a long table-land, to the height of 1,000 ft. or more, and then comes a wild mountain country as far as the eye can see. To the N.E. there is a belt of level land, which appears to extend through the peninsula to the Gulf of California.

The native name of this lagoon is *Susa Maria*. In a northerly direction from its head, distant 35 miles, rises a mountain, showing three swells of land at its summit; it is called *San Ignacio*, and at its foot, not far from the lagoon, is the old mission bearing the same name. As you view this mountain from the coast, a still higher elevation is seen, standing alone, with rounded peak. A small village now occupies the site of the mission, and near it are extensive cultivated tracts of fertile land.

At 10½ miles westward of San Ignacio Point is the entrance of another lagoon, with a breaking shoal extending three-quarters of a mile off its mouth, which only small vessels can cross. It extends about 8 miles to the northward, and is from 3 to 8 miles wide. From hence the western shore of Ballenas Bay trends S.W. by S. ½ S., 9 miles, to Abreojos Point.

Point Abreojos ("Open-your-eyes"), so named from the dangers lying off it, is low and sandy on the surface, but a reef extends a short distance South of it, and close to its eastern side are numerous detached rocks. It is high water here, on full and change, at 9^h; the tide rises about 5 ft. There is good anchorage in 6 fathoms, sand, protected from the prevailing winds, between

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Abreojos Point and the next point to the N.E., half a mile off the sandy beach, where boats may easily land in moderate weather. Vessels approaching this anchorage should give a wide berth to a rocky patch of 4 fathoms, lying $1\frac{1}{2}$ mile S.E. by S. $\frac{1}{4}$ S. from Abreojos Point, with 5 to 8 fathoms between; the swell was observed to break occasionally in this vicinity.

The plains around Abreojos Point are inhabited by large numbers of coyotes and prong-horned antelopes. There is a pond of bad brackish water at the foot of a barren hill, 277 ft. high, 3 miles N. $\frac{1}{2}$ W. from the point; this hill is separated from a conspicuous range of table-land, 600 ft. high, and forms a good landmark. The shores near the point are strewn with the bones of whales.

Whale Rock, about $2\frac{1}{2}$ cables long and 4 ft. above high water, lies 4 miles W. by S. $\frac{1}{2}$ S. from Abreojos Point. A breaking reef extends a quarter of a mile south-eastward of it, and a dangerous reef lies half a mile south-westward of it, with 5 to 10 fathoms between; the latter reef is about 7 cables long North and South, and one-third of a mile wide, many of the rocks being awash at low water, and the sea breaks heavily over them. There is a depth of 5 fathoms in the passage, $1\frac{1}{2}$ mile wide, between Whale Rock and the land.

Between Abreojos Point and Asuncion Point, 47 miles to the W.N.W., the coast is low and sandy, rising gradually to hills and table-lands, 600 to 1,000 feet high, with high and broken mountains in the distance. The beach fronting the shore line, being composed of white sand, is seen a considerable distance at sea, contrasting with the brown clay cliffs and banks. For 11 miles from Abreojos Point the soundings are irregular, but beyond this they are regular, and the water deep. About 8 miles from the point the coast is bordered for 2 miles by a shoal reaching over 1 mile off, and here is probably the mouth of a lagoon which extends parallel with the coast from near the point. At 2 miles farther on another shoal extends about half a mile off.

San Hipolito Point, $27\frac{1}{2}$ miles W.N.W. from Abreojos Point, is a low, black, rocky point, backed by sand-hills; a breaking reef extends nearly half a mile southward of it. At $5\frac{1}{2}$ miles North of it is a remarkable table-shaped mountain, 1,227 ft. high. In the open bay, named San Hipolito, formed by the indentation of the coast-line eastward of the point, there is good anchorage in 5 to 7 fathoms, sand, under the lee of the point, and half a mile off shore.

Asuncion Point, 19 miles W. by N. $\frac{1}{4}$ N. from San Hipolito Point, is a low, sharp, bluff point, with a conical mound, about 75 ft. high, at its outer extremity. A reef extends a short distance off it, and the sea breaks heavily on some large detached rocks on either side of it. In *Asuncion Bay*, eastward of the point of the same name, there is good anchorage, in moderate weather, in 5 to 7 fathoms, close to the shore, under the lee of the point.

Asuncion Island, about three-quarters of a mile southward of Asuncion Point, is three-quarters of a mile long, and less than $2\frac{1}{2}$ cables wide. It is of sandstone, and entirely barren, and was the resort of vast herds of sea

animals; some hills near its southern end are 100 ft. high. It is surrounded by rocks and kelp, and from its northern end a breaking reef of rocks, many above water, and two of large size, extends 3 cables northward and half a mile westward. A solitary rock, awash at low water, lies about midway between the island and the point, and between this rock and the point is a clear passage, a quarter of a mile wide, through which 4 to 6 fathoms may be carried by keeping about $1\frac{1}{2}$ cable off the point; but it should only be done in cases of emergency. The tide rises about 5 ft.

Between Asuncion Point and San Roque Point, $7\frac{1}{2}$ miles to W. by N., the coast forms the open bay of *San Roque*, the shore of which is generally bluff, with occasional beaches fronting it. *San Roque Point* is a light-coloured bluff, 30 to 50 ft. high, backed by a hill 543 ft. high; 16 fathoms water is found within half a cable of it.

San Roque Island, $2\frac{1}{2}$ miles E. by S. $\frac{3}{4}$ S. from San Roque Point, is a rugged rock 40 ft. high, 1 mile long East and West. A breaking reef extends a quarter of a mile from its eastern end, and half a mile E. by N. from the extremity of the reef is a patch of rocks, with 11 fathoms between. A 3-fathoms shoal lies half-way between these rocks and the shore, and heavy breakers extend nearly a mile off the land North of the island. The channel between should only be used by boats or very small vessels.

San Pablo Bay is an indentation, $1\frac{1}{2}$ mile deep, between San Roque Point and San Pablo Point, about 3 miles to the N.W. It affords good anchorage in 10 to 15 fathoms, about three-quarters of a mile from the shore. At its head is a sandy beach, with steep bluffs on either side. *San Pablo Point* is a dark, slate-coloured bluff, with a prominent hill 760 ft. high. A reef extends about half a mile southward of it. A few miles in the interior are extensive tablelands, 1,000 to 2,000 ft. high, behind which is a remarkable range of peaks, 2,000 to 3,000 ft. high, and of variegated colours, probably the *Sierra Pintada* of Sebastian Viscaino.

Between San Pablo Point and Morro Hermoso, 24 miles to N.W. $\frac{1}{2}$ W., the coast forms the open bay of *San Cristobal*, the shores of which consist principally of bluffs and sand cliffs, 50 to 100 ft. high. There is a deep arroyo at 3 miles North of San Pablo Point, and at the head of the bay is a shingle and sand beach, 4 miles in extent. In the northern part of the bay there are a few large rocks near the shore.

Morro Hermoso is a bare, rocky cliff, rising abruptly to a hill, 900 ft. high; the coast N.W. of it consists of steep bluffs, 50 to 100 ft. high, backed by high hills, and at 6 miles from it is a small open bay, eastward of *Thurloe Head*, where there is anchorage in 6 to 7 fathoms, protected from the prevailing winds. *Thurloe Head* is a bold, rocky point, with a reef extending a short distance southward of it; from hence the coast trends $2\frac{1}{2}$ miles N.W. $\frac{1}{2}$ W. to *Cape Tortolo*, and is a long irregular cliff, high, rocky, and steep. Kelp extends a quarter of a mile off it.

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SAN BARTOLOME BAY, called *Turtle Bay* by the whalers, is the best harbour between San Diego and Magdalena Bay. Its entrance lies between Cape Tortolo and Kelp Point, about $1\frac{1}{2}$ mile apart, within which it is about $2\frac{1}{2}$ miles in diameter. The northern and eastern shores are low shingle and gravel beaches, but the western shore consists of high bluffs. The bay was formerly much resorted to by whalers for cooping their oil and refitting. The early Spanish navigators reported the existence of large beds of asphaltum in the vicinity. Fish, turtle, and sea-fowl abound, but no fresh water was found.

The bay is formed by a high range of loose cliffs on the North, and a fine gravelly bay on the East, and a coarse sandy tongue connects a high peninsula, or island at high water, in its centre, forming a third southern bay. From this peninsula rocks extend northerly, partly under water, jutting into the heart of the bay, and forming a safe landlocked position, having 5 fathoms within. The anchorage taken by H.M.S. *Sulphur* was in 7 fathoms, sheltered from all but S.W. winds, but had holding-ground. The surrounding land is high and mountainous. The place of observation on the northern head of the bay is in lat. $27^{\circ} 40' N.$, long. $114^{\circ} 51' 20'' W.$ Wood may be procured here—in case of extreme necessity—by searching for low green bushes in the level land about the shores; the roots are found running near the top of the ground 8 or 10 ft. long, and often 6 inches through; they burn readily.—*Belcher*.

Cape Tortolo is a rocky point about 20 ft. high, rising rapidly to 425 ft., and from it a breaking reef extends nearly a mile to the north-westward, with a rock, 2 ft. above high water, on its outer end. There are three large rocks between the outer rock and the cape: *Sulphur Rock*, the outer one, is 30 ft. high; *Coffin Rock*, 50 ft. high, comes next; and the one nearest the cape is 60 ft. high. *Kelp Point* is about 30 ft. high, with many outlying rocks surrounded by kelp.

The entrance to San Bartolomé Bay is a mile wide between the rocks on either side, and may be found by steering for a jagged peak, 690 ft. high, bearing N. $\frac{1}{2}$ E., until the entrance is visible, when the eye, assisted by the lead, is the only guide needed. After passing Cape Tortolo Reef, vessels can anchor anywhere, the soundings being regular, and the bottom sand, sheltered from every wind. The outer bay is exposed to the swell. It is high water, on full and change, at $9^h 10^m$; springs rise 7 to 9 ft.

At 6 miles W. by N. $\frac{1}{2}$ N. from Kelp Point, the coast between being rugged and barren, is *Breaker Point*, a steep, rocky headland, with numerous detached breaking rocks southward of it. From hence the coast trends N.W. $\frac{1}{2}$ N., $9\frac{1}{2}$ miles, to San Eugenio Point, and consists of rocky bluffs, with projecting points and outlying rocks surrounded by kelp. Sharp bare hills rise close to the coast, the most conspicuous one, over 600 ft. high, lying $1\frac{1}{2}$ mile from Breaker Point.

San Eugenio Point, the N.W. extremity of the peninsula which forms the

South shore of Sebastian Viscaino Bay, is a low, dark, rocky projection, surrounded by a reef, extending about a quarter of a mile off. About half a mile eastward of the point is a little cove, where there is a whaling station.

Natividad Island, about 4 miles West of San Eugenio Point, is extremely barren, neither shrub nor tree being found on it; it is resorted to by large numbers of sea-fowl as a breeding place. It is about $3\frac{1}{2}$ miles long W.N.W. and E.S.E., from a half to 1 mile wide, rising to 502 ft. in height. Its shores are mostly steep and rocky, with detached rocks and kelp; at the S.E. end is a sand beach. Some cargoes of guano have been taken from *Maria Rock*, 15 feet high, half a mile off the N.W. point, and connected with it by a reef. Several reefs extend off the N.E. side of the island, and about 2 cables West of the southern point is *Sail Rock*, 40 ft. high, with a short reef extending south-eastward of it, on which the sea only breaks at long intervals. A reef extends about a quarter of a mile eastward of the southern point, and on its extremity is a flat-topped rock, about 25 ft. high, named *Flat Rock*.

Dewey Channel, between San Eugenio Point and Natividad Island, has much foul ground and irregular soundings on the island side. At a mile East of Flat Rock is a rocky 3-fathoms shoal, half a mile in diameter, over which the sea only breaks at long intervals in fine weather. For $1\frac{1}{2}$ mile eastward of this, numerous patches of 6 to 7 fathoms exist, but on the San Eugenio side there is a clear passage, a mile wide, through which 17 to 20 fathoms may be carried by keeping about $1\frac{1}{2}$ mile off shore, the kelp plainly marking the channel.

CERROS ISLAND, or *Cedros*, forming the western side of Sebastian Viscaino Bay, is separated from Natividad Island by *Kellett Channel*, $7\frac{1}{2}$ miles wide, deep, and clear. Cerros is $21\frac{1}{2}$ miles long N. by W. and S. by E., its width varying from 9 miles near the southern end to 3 miles near the northern. The southern part of the island is generally barren, but the northern portion is comparatively fertile, the crests and western slopes of the mountains being covered with cedars and pines. Goats and rabbits are plentiful, and there is said to be a few deer; seals, &c., abound on the shores. The island is said to be rich in minerals.

It is an island of mountains throughout its whole extent, being a mass of high, abrupt peaks, the highest of which is 3,955 ft. above the level of the sea, and may be distinctly seen, in clear weather, 60 miles. On a near approach, the sombre, barren appearance of all brought to view is anything but inviting. Many of the southern slopes present a dark red hue, interspersed with high variegated cliffs, which give a little change to the otherwise dull scene. On landing, one is at once fully sensible of the extremely dry atmosphere prevailing; still there must be, occasionally, heavy rains, producing mountain torrents.

Morro Redondo Point, the S.E. extremity of Cedros Island, is a rocky cliff, 30 ft. high, backed by a low hill, with numerous rocks southward and westward of it. The officers of the U.S.S. *Narragansett* made their observation spot, on a low point half a mile to the northward, to be in lat. $28^{\circ} 1' 48.7''$ N.,

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long. $115^{\circ} 11' 2.6''$ W. Here it is high water, on full and change, at $9^h 10^m$; springs rise 7 to 9 ft. To the northward of this the coast recedes, forming a good anchorage in 7 to 10 fathoms, sand, within a quarter of a mile of the beach, as the water deepens suddenly. About 4 miles northward of the anchorage is a good watering-place, easily recognised by a patch of tall, rank grass, lying behind a solitary sand beach. The water is deep close to the shore. Northward of the watering-place the eastern side of the island is a succession of rocky bluffs and ravines, with short stretches of gravel beach, behind which the land rises abruptly to the mountains.

On the N.E. side, about 3 miles from the extreme North end, a low sandy point makes out; to the southward of this is good anchorage during the prevailing coast winds. In a ravine near it is a small stream of fresh water; and likewise in several of the valleys leading from the shore line to the southward, water may be found within a mile of the beach. At one of these places it is of excellent quality. The only practicable place, however, for a ship to obtain a large supply is on the S.E. side, where there is a spring running among rushes at the foot of a high peak close to the shore. Anchorage may be had off this spring, within 2 cables' lengths of the shore, in 20 fathoms of water; but a much better place for a ship to lie is 2 miles farther South, off a low shingle beach.

A vessel can always find shelter from the N.W. winds on the South side of the island, in depths varying from 6 to 25 fathoms; these winds blow with the regularity of a "trade," from May to October, and the only precaution to be kept in mind in choosing an anchorage is to avoid fixed kelp. From October to May the winds are generally light and the weather delightful. Occasionally a strong "norther," or a light S.E. gale, blows the first part of the winter, and strong gales from the N.W. again set in about the 1st of May.—*Capt. C. M. Scammon.*

The North point of Cerros Island is formed by broken bluffs, with many large outlying rocks. At the back of it is a sharp peak, 1,761 ft. high, with some cedar trees on the summit. For 8 miles from the northern point the West coast is similar to the eastern, but the rocks off it are more numerous, and extend farther off; thence it curves round to the S.W., and is an unbroken line of cliffs to a point $2\frac{1}{2}$ miles North of Cape San Augustin, where a rocky reef extends 2 miles off to the N.W., with a conspicuous rock, named *Red Rock*, half a mile from the N.W. extremity. *Cape San Augustin* is a bold basaltic headland, the S.W. extremity of the island. There is generally a heavy surf on the western side of the island, and there are extensive fields of kelp along the S.W. part.

The southern coast is similar to the eastern. *South Bay*, 2 miles eastward of Cape San Augustin, affords anchorage in about 7 fathoms, close to the shore, sheltered from the prevailing winds, but open to southerly gales, which some-

times occur during the early part of winter; rocks extend half a mile off the N.W. side. Patches of 5 to 10 fathoms, rock, are found 3 miles southward of the coast, between the eastern limit of South Bay and Morro Redondo Point.

San Benito Islands are a group of three barren islands, surrounded by outlying rocks and kelp, the easternmost of which lies $17\frac{1}{4}$ miles S.W. by W. $\frac{1}{4}$ W. from the North point of Cerros Island. The group extends about 4 miles East and West, and $1\frac{1}{2}$ mile North and South, the summit of the western island being in lat. $28^{\circ} 18' 8''$ N., long. $115^{\circ} 36' 10''$ W. The narrow passages between them can only be used by boats. The seal and the sea-elephant are the only animals found upon them; they are destitute of wood and fresh water.

The eastern island is about 500 ft. high, but the middle one is small and low; the western one is the largest and highest, being $1\frac{1}{4}$ mile long, and three-quarters of a mile wide, with a mound in the centre 650 ft. high. There is anchorage in 10 fathoms, sand, a little West of the S.E. point, with the mound bearing N.W., and the North end of the eastern island open of the S.E. point, bearing N.E. Just eastward of the point is a large red rock, behind which is a small shingle beach, on which a landing-place may be found. In 1853 the remains of what was supposed to be a Japanese junk were found on the S.W. end.

Pinnacle Rocks, about three-quarters of a mile West of the S.W. point of the large island, are two small rocks with only 6 ft. water over them, 80 ft. apart N.E. and S.W. The sea breaks on them in all weathers.

SAN SEBASTIAN VISCAINO BAY,* an extensive indentation of the coast, lies within Cerros Island; it is about 60 miles in diameter, and within its limits are several smaller bays and anchorages. Whales were formerly numerous here at certain seasons; sharks are found in the shoaler waters, and other varieties of fish are plentiful. For a few miles eastward of False Point, the southern shore of the bay consists of high bluffs, and the mountains approach the coast, but from thence its southern and eastern coasts are for the most part low and sandy, with extensive marshes, high mountains being visible far in the interior.

At $1\frac{1}{2}$ mile N.E. $\frac{3}{4}$ E. of San Eugenio Point (page 191) is *False Point*, steep and rocky, half a mile northward of which is a dangerous oval reef, three-quarters of a mile long, and surrounded with kelp, with a rock awash near its centre, on which the sea breaks heavily. *Chester Islets*, 18 ft. high, are two rocks covered with guano, and surrounded with kelp; the westernmost lies

* Sebastian Viscaino, from whom this name is derived, was charged by the Spanish viceroy of Mexico, Don Gaspar de Zuniga, Count de Monterey, to survey these coasts. He set sail on this commission from Acapulco, May 5th, 1602, with four vessels, and among others discovered and named the Port of Monterey, which remained the capital of this country up to recent times.

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half a mile N.E. of False Point, and has a small rock close off its North side. The eastern islet lies two-thirds of a mile farther to the E. by S. From hence to the eastward the coast is clear, with 5 to 6 fathoms within a cable of the beach, till about 5 miles south-westward of the entrance of Scammon Lagoon, when a sand bar commences.

Scammon Lagoon, or *Ojo Liebre*, is the principal lagoon opening into the bay. Capt. Scammon states that its eastern limit is about 35 miles from the bar, and that it varies from 4 to 12 miles in width. There are many low islets in it, with numerous sand bars, some uncovered at low water. *Fort Lagoon* is a branch extending 8 miles southward of the main lagoon, and is navigable. Whales were abundant here when the lagoon was first entered by the whalers in 1858, and near its head are the salt-fields of *Ojo Liebre*. The surrounding country is a sandy desert; the nearest fresh water is 7 miles distant, and all supplies, except fish, turtle, and sea-fowl, must be brought from the interior or by sea. To the South and S.W. may be seen the boulder-like peaks of the Santa Clara Mountains.

Extensive shoals make off from the entrance of Scammon Lagoon, which is marked by white sand bluffs, 30 to 40 ft. high, on either side. The bar is constantly changing, and a stranger must send a boat to examine it before attempting to enter. It is said that a vessel drawing 18 ft. has crossed the bar which is half a mile wide, but probably 12 to 15 ft. would be found at ordinary high tides, deepening within to 4, 5, and 6 fathoms, a good channel being found along the South shore, reaching to near the head of the lagoon. During the stay of the *Narragansett* the sea was breaking heavily on the bar, preventing any examination.

Black Warrior Lagoon, the entrance of which lies $14\frac{1}{2}$ miles N.E. by N. from that of Scammon Lagoon, takes its name from that of a barque lost on the bar in 1859. It is about 10 miles long North and South, and about 9 miles wide, with shoal water extending $1\frac{1}{2}$ to 2 miles off the entrance. Vessels drawing 13 ft. have crossed the bar.

Manuela Lagoon, the entrance of which lies $7\frac{1}{2}$ miles North of that of Black Warrior Lagoon, is nearly 8 miles long North and South, and about 2 miles wide, a narrow strip of low sand beach, interspersed with small hillocks, separating it from the waters of the bay. The bar extends about a mile off the entrance, and has 5 ft. over it at low water; the sea usually breaks on it in fine weather, except near high water.

From the entrance of Manuela Lagoon the coast trends to the northward, and then suddenly turns to the westward for about 2 miles to Lagoon Head, $3\frac{1}{2}$ miles N.W. $\frac{1}{2}$ W. of the entrance, thus forming a small open bay affording good anchorage in 3 to 8 fathoms, sand. There is a good landing-place on a sand beach about 2 miles East of Lagoon Head.

Lagoon Head, the *Cabo Negro* of the old Spanish charts, is a dark headland, 475 ft. high, and visible 30 to 40 miles, first appearing like an island.

From Lagoon Head the coast trends 13 miles N. $\frac{1}{4}$ E., and then 9 miles N.W. by W. to the South point of Santa Rosalia Bay. Near the head the coast consists of bluffs about 200 ft. high, but from thence they decline to a height of 50 to 100 ft. High hills rise a few miles inland, and mountains are visible in the interior, the most conspicuous being *High Leaning Peak*, to the E.N.E. of the bay.

Santa Rosalia Bay is about 6 miles wide between its southern point and Rosalia Point to N.W. $\frac{1}{4}$ W., affording good sheltered anchorage in 5 to 8 fathoms, sand. The best landing will be found on a shingle beach on the North side of the bay. Rocky cliffs line the eastern shore, and off the southern low point a dangerous reef extends half a mile southward, surrounded by kelp. About 2 miles W. by N. of Rosalia Point is *Elide Island*, a barren rock, about 40 ft. high, the coast between being composed of rocky bluffs, 50 to 75 ft. high. Elide Island is about 3 cables long, a favourite resort of seals and birds, and is connected with the land, half a mile distant, by a breaking sand-spit. Vessels sometimes anchor on the S.E. side of it, but there is usually a heavy swell.

For 3 miles N.N.W. of Elide Island the coast consists of low sand beaches, and then follow bold and rocky cliffs, 50 ft. high, for $3\frac{1}{4}$ miles W. $\frac{1}{4}$ N. to Rocky Point. *Rocky Point* is a steep cliff, 75 ft. high, and at $1\frac{1}{4}$ mile north-eastward of it is a conspicuous conical hill, 1,000 ft. high. From hence to Black Point, $10\frac{1}{4}$ miles to N.W. $\frac{1}{4}$ N., the coast is composed of sand beaches, with the exception of a steep, projecting, rocky point midway between, with a hill, 500 ft. high, rising close to it. *Black Point*, the southern limit of Playa Maria Bay, is a low, dark, rocky projection, backed by white sand.

Playa Maria Bay is formed between Black Point and Maria Point, $5\frac{1}{4}$ miles to W. by N. $\frac{1}{4}$ N. The bay is open but clear, and its shores are low, sandy, and barren. At 2 miles inland from its head is a hill called the *Nipple*, 1,132 ft. high, and on the shore of the northern part of the bay is what Capt. Kellett called *Station Peak*, 256 ft. high. There is good anchorage in 6 or 7 fathoms, sand, in the northern part of the bay, protected from the prevailing wind. It is high water, on full and change, at 9^h 20^m; springs rise 7 to 9 ft.

Maria Point, the northern point of Sebastian Viscaïno Bay, is low and rocky, with sand-hills rising 100 ft. high, a quarter of a mile northward of it. For $1\frac{1}{4}$ mile N.W. $\frac{1}{4}$ W. of it the coast is steep and rocky; it then becomes low for about 3 miles to Cone Point, forming the shore of *Falsa Bay*, in the northern part of which there is anchorage in 4 to 6 fathoms, pretty well protected from the prevailing winds. There is a wide arroyo at the bottom of the bay. *Cone Point* is steep and rocky, with a reef extending a quarter of a mile southward of it; just North of it is *Red Cone*, 200 ft. high, appearing like an island when first seen from the northward.

At $10\frac{1}{4}$ miles N.W. $\frac{1}{4}$ W. of Cone Point is Blanco Point, the coast between receding about 3 miles, forming *Blanco Bay*, the shores of which are a suc-

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cession of bluff points and sand beaches. There is good anchorage here, protected from the prevailing wind. *Blanco Point* is a sand cliff, about 50 ft. high, and is the eastern of two points forming the northern limit of the bay; between them there is a cove about a mile wide, and the western point is surrounded by detached rocks.

At 33 miles N.W. by W. $\frac{1}{4}$ W. of Blanco Point is *Canoas Point*, the coast between being composed of sand bluffs and rocky points alternating with low sand beaches. From seaward three distinct mountain ranges are visible, rising one behind the other. About $13\frac{1}{2}$ miles northward of Blanco Point, and half a mile off shore, is a solitary rock, 20 ft. high, surrounded by kelp; large quantities of drift wood were found on the adjoining beach.

Canoas Point is a sharp, perpendicular, sand bluff, 224 ft. high, surrounded by hills 700 to 1,200 ft. high, backed by mountains about 2,000 ft. high. In good weather partially protected anchorage will be found under the lee of the point, in 5 to 7 fathoms, sand, about half a mile from the shore; the tide rises about 4 ft. From hence the coast trends N.W. by W. $\frac{1}{4}$ W., $32\frac{1}{2}$ miles, to *San Antonio Point*, and consists of sand bluffs 50 to 100 ft. high, backed by moderately high hills, and in some parts by table-lands 1,000 to 2,000 ft. high, of which *Sombrero Peak*, 1,968 ft. high, lying about $2\frac{1}{2}$ miles northward of Bluff Point, is the most conspicuous.

Bluff Point, 13 miles N.W. by W. $\frac{1}{4}$ W. of *Canoas Point*, is 100 ft. high, and between it and a remarkable gorge 3 miles southward of *San Antonio Point*, is a large field of kelp, extending about 5 miles off shore; a depth of 12 fathoms, sand and rock, was found in it at 4 miles off shore.

Sacramento Reef, on which the P.M.S.S. *Sacramento* was lost in 1873, lies $3\frac{1}{2}$ miles S.W. by W. $\frac{1}{4}$ W. from *San Antonio Point*, and is very dangerous. It is about a mile in extent N.W. and S.E., and half a mile wide, with several large rocks awash and above water, over which the sea constantly breaks. In the passage between the reef and *San Geronimo Island*, 3 miles to N.W. by N., and also between them and the land, there are large dense masses of kelp, which should be avoided if practicable.

San Geronimo Island is a barren rock, three-quarters of a mile long and less than one-third of a mile wide, covered in many places with a mixture of sand and guano. Near the centre is a peak, 172 ft. high, northward of which are two lower ones. Its shores consist of rocky beaches and cliffs, 10 to 20 ft. high, and they are surrounded by outlying rocks and kelp. A reef extends half a mile off the southern extremity, with a rock above water on its outer end, over which the sea breaks heavily. The U.S.S. *Hassler* found a rocky $5\frac{1}{2}$ -fathoms patch about $1\frac{1}{2}$ mile northward of the island, and it is possible that other shoal spots may exist.

There is anchorage in about 7 fathoms, sand, eastward of *San Geronimo Island*, but there is usually an uncomfortable swell; the tides rise about 5 ft.

On the S.E. side, at the base of the highest peak, there is a good landing-place on a small shingle beach.

From San Antonio Point to Baja Point, 13 miles to N.W. $\frac{1}{2}$ N., the coast consist of sand bluffs, 50 to 100 ft. high. *Baja Point* is a sand cliff, about 30 ft. high, off which a reef extends a short distance southward, surrounded by kelp. Eastward of *Baja Point* is *Rosario Bay*, so named from the old mission of El Rosario, situated in a fertile valley, about 11 miles to N.E. by E. of San Antonio Point. There is safe and sheltered anchorage in the bay in 5 to 6 fathoms, sand. It is stated that the country, at the head of the bay near *Baja Point*, is fertile, and that supplies of vegetables, fresh beef, and water may be obtained there.

At $5\frac{1}{2}$ miles northward of *Baja Point* is a ranch, lying in a small indentation of the coast, between a dark hill, 409 ft. high, and an arroyo. For about 22 miles N. by W. of *Baja Point*, the coast consists of alternating sand bluffs and dark-coloured cliffs, gradually decreasing in height to the point. To the N.W. of this the shore is a low sand beach, as far as the entrance of the lagoon North of Port San Quentin, forming *San Quentin Bay*. The water is shoal for several miles off shore, and a long swell usually rolls in, making it an uncomfortable anchorage.

PORT SAN QUENTIN is the name applied or chosen by Sir Edward Belcher for the harbour, which, under several Spanish and English charts, is called the Bay of San Francisco. This is much preferable, as the triple repetition of the latter name on this coast, applied by the Spaniards in honour of their patron saint, peculiarly so regarded by the navigators in the Pacific, has led to confusion. It is a small and perfectly secure anchorage, protected on every side, at the N.W. end of San Quentin Bay. The adjacent country is low and sandy, and no fresh water can be found near the coast.

"Port San Quentin does not afford anything equal to San Diego, but it is more secure when within. The whole coast is dreary, being either sand-hills or volcanic mountains, five of which, very remarkably placed, caused one of the early navigators to call it the Bay of Five Hills. It is the Bay of the Virgins of the former, and Port San Quentin of the later Spanish surveyors.* As it appears engraved on an extensive scale under the latter name, I have preferred that name for it."—*Sir Edward Belcher*.

Cape San Quentin (or *Virgenes*), 22 miles N.W. by N. from *Baja Point*, is the S.E. extremity of a peninsula forming the western side of the bay, port, and lagoon of San Quentin; *Mount Mazo*, about a mile north-westward of it, is 210 ft. high. About two-thirds of a mile N.E. by N. $\frac{1}{2}$ N. of it is *Entrada Point*, the eastern point of the peninsula, a low and rocky point which should

* The North promontory is called, by Vancouver, Point Five Hummocks. In his chart the bay to the North of Point Zuniga, the North end of the promontory, and 8 miles N.N.W. of Cape San Quentin, is called the Bay de los Virgenes.

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not be approached from the southward within a quarter of a mile; the coast is a low and rocky beach for about one-third of a mile from the cape, and from thence to Entrada Point the beach is sandy. At half a mile N.W. of the latter is *Sextant Point*, low and sandy, with shoal water between; and northward of this is the anchorage.

The bar lies eastward of Entrada Point, and has about $2\frac{1}{2}$ fathoms on it at low water. Vessels drawing over 12 ft. should not attempt to enter without sending a boat to examine the channel, which is narrow and tortuous, and liable to change with every southerly gale. To enter keep about half a mile off the southern shore of the peninsula until Rocky Point, nearly $1\frac{1}{2}$ mile to N.W. of Entrada Point, is open eastward of Sextant Point, when haul up to North, not getting into less than $3\frac{1}{2}$ fathoms; when Rocky Point bears N.W. by W. $\frac{3}{4}$ W. steer for it until past Sextant Point, and Mount Mazo bears S.W. by W., when haul up to W. $\frac{1}{2}$ S., and anchor anywhere in $4\frac{1}{2}$ to $5\frac{1}{2}$ fathoms, sand. It is high water, on full and change, at 8^h 30^m; the tide rises 5 ft. The United States surveyors place the observation spot on Sextant Point in lat. $30^{\circ} 22' 15''$ N., long. $115^{\circ} 59' 7''$ W.

About 5 or 6 miles north-eastward of the anchorage is the village of *San Quentin*, at the foot of some hills, and near some salt-ponds, to which there is said to be a channel through the lagoon. A small quantity of salt is exported.

Near the coast, northward of the bay and lagoon, are the five remarkable hills before mentioned, rising from a tract of very low and nearly level land, forming a projecting promontory, named Point Five Hummocks by Vancouver, who says that it is as conspicuous and remarkable as any projecting point the land affords. In coming down the coast from the northward, he had taken it for a series of detached islands. The south-westernmost hill is 324 ft. high, and the others range from 500 to 1,000 ft. in height.

From Cape San Quentin the coast trends about half a mile westward to *Afuera Point*, and then nearly a mile north-westward to *Reef Point*, and is low and rocky, with numerous projecting points and outlying rocks, over which the sea breaks heavily. A reef extends about a quarter of a mile westward of the point. From hence to South-west Hill, about $4\frac{1}{2}$ miles farther on, the coast is a low sand beach, backed by sand-hills, 100 to 150 ft. high.

San Martin Island, the *Virgenes* of Sir E. Belcher, and also known as *Cenizas* or *San Hilario*, lies about 9 miles N.W. by W. of Cape San Quentin, and about $2\frac{1}{2}$ miles off that part of the coast named *Point Zuniya* on Vancouver's chart, there being a depth of 10 to 15 fathoms in the channel between. The island is about $1\frac{1}{2}$ mile in diameter, surrounded by detached rocks and kelp, and resorted to by great numbers of seals and sea-fowl. Its western side is formed of steep high cliffs, but its N.E. and S.E. sides terminate in low sandy land, extending toward the continent. Near the centre are two remarkable peaks, the westernmost of which is an extinct volcano, 497 ft.

high. It is quite barren, only producing the prickly pear, and a few stunted bushes.

On the S.E. side of the island there is good anchorage, off the shallow entrance to a small lagoon; vessels can anchor anywhere off the N.E. side. The best place to anchor in is *Hassler Cove*, a snug little bight on the eastern side, protected from all winds but the North; anchor in 7 to 9 fathoms, with the northern end of the boulders forming a breakwater, on the East side of the cove, bearing E. by S. $\frac{3}{4}$ S.

Ben Rock, with 9 to 12 ft. water over it, and on which the sea only breaks occasionally in moderate weather, lies $2\frac{1}{2}$ miles South of the East end of San Martin Island, and $4\frac{1}{2}$ miles from the land, with *Mount Ceniza*, 516 ft. high, bearing E. by N. $\frac{1}{2}$ N., and just open southward of South-west Hill. There is no kelp around it.

Between Reef Point and Cape Colnett, 38 miles to N.W. $\frac{1}{2}$ N., there is a moderate depth of water near the shore, which appears to be free from outlying dangers. From near South-west Hill the coast consists of bold rocky cliffs for about 2 miles northward, succeeded by a low sand beach $1\frac{1}{4}$ mile in extent. Then perpendicular, dark, rocky cliffs, 150 to 200 ft. high, extend for $1\frac{1}{2}$ mile northward, abreast of San Martin Island.

Between San Martin Island and Cape Colnett the coast forms a slight indentation, known as the bay of *San Ramon* or *De las Virgenes*, the coast consisting of sand-hills from 25 to 100 ft. high. About 9 miles northward of San Martin Island, fields of kelp extend 3 or 4 miles from the shore, as far as the anchorage in Colnett Bay.

CAPE COLNETT is a remarkable headland, semi-circular in form, with perpendicular, dark cliffs, 100 to 350 ft. high, rising from a base of light sandstone. On its southern side, formed by the coast trending $2\frac{1}{2}$ miles to the N.E., is *Colnett Bay*, where good anchorage may be found in 6 to 9 fathoms, sand, abreast of a remarkable gorge. The best landing is at its head.

Cape Colnett was thus named by Vancouver, who says:—"This promontory bore a very singular character as we passed. The cliffs composing it are, about the middle, between their summit and the water side, divided horizontally nearly into two equal parts, and formed of different materials; the lower part seemed to consist of sand or clay, of a very smooth surface, and light colour. The upper part was evidently of a rocky substance, with a very uneven surface, and of a dark colour. This seemed to be again divided into narrow columns by vertical strata. These apparent divisions, as well horizontally as vertically, existed with great uniformity all round the promontory."

The coast between Cape Colnett and Santo Tomas Point, 40 miles to N.W. $\frac{1}{2}$ N., recedes considerably, and for 10 miles northward of the cape has the same cliffy character; from thence it consists of a succession of broken bluffs and low beaches, with no known outlying dangers. A few miles inland the coast range attains an elevation of 1,500 to 2,000 ft. About 5 miles from

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the coast, and 21 miles North of Cape Colnett, is the old mission of *San Vicente*, now nearly abandoned. At $6\frac{1}{2}$ miles S.E. $\frac{1}{2}$ E. of Santo Tomas Point is *San José Point*, off which a patch of kelp extends $2\frac{1}{2}$ miles in deep water.

Santo Tomas Point is low and rocky, rising abruptly to a height of 395 ft., the hills behind it attaining a height of 3,500 ft. at a few miles from the coast. At 1 mile West of the point lies a small cluster of detached rocks, named *Soledad Rocks* or *Solitarios Island*, 20 ft. high. The water around them is deep, and the channel between them and the point may be used by keeping clear of the kelp on either side.

At half a mile southward of Santo Tomas Point the coast turns sharply to the eastward, forming a small bight, where there is good anchorage in 5 to 10 fathoms, sand, sheltered from the prevailing winds. To reach it steer for the bight until a small sand beach, northward of the inner point, with a few rocks at its southern end, is open, then haul up northward and anchor, as soon as *Soledad Rocks* are shut in, in 7 to 8 fathoms, sand, within a quarter of a mile of the landing-place, which is on the small sand beach. When the *Narragansett* was here, there was a wooden building near the inner point, used as a whaling station. It is high water, on full and change, at about 9^h; the tide rises about 6 feet.

About 16 miles from the coast is the village of *Santo Tomas*, on the site of the old mission, in a very fertile valley, producing both temperate and tropical fruits. A river supplies it with water, which disappears as it approaches the coast; ducks, &c., are abundant near its banks in winter. The road from the anchorage to the village runs along the coast for about 2 miles southward and then it follows the course of the river.

Between Santo Tomas Point and Banda Point, 12 miles to N.W. by N. $\frac{1}{2}$ N., the coast is high and precipitous, with deep water close-to, and numerous outlying rocks. *Banda* or *Grajero Point* is a bold rocky headland, 500 ft. high, forming the S.W. limit of Todos Santos Bay, with a rocky ledge extending about three-quarters of a mile N.W. of it.

Todos Santos Islands are two barren islands, surrounded by detached rocks and kelp, with a boat channel between them. The southernmost lies 3 miles N.W. $\frac{1}{2}$ W. of Banda Point, and is about $1\frac{1}{2}$ mile long, less than half a mile wide, and 374 ft. high. The northernmost island is about half a mile long, and from 30 to 60 ft. high. In good weather there is anchorage in 10 fathoms, sand, on the N.E. side of the large island, with the N.E. extreme bearing West.

Todos Santos Bay.—From Banda Point the land sweeps around in a semi-circular form to *Ensenada Point*, 8 miles to N.E. by N. $\frac{1}{2}$ N., forming Todos Santos Bay. Numerous rocks line its southern shore, and at its head is a low sand beach, $2\frac{1}{2}$ miles long. Many kelp patches are found in the bay and lining the beach. About 3 miles eastward of Banda Point is a whaling station, off which there is good anchorage in 3 to 10 fathoms, sand. *Ensenada Point* North Pacific.

is a steep hill, 370 ft. high, and eastward of it there is a snug anchorage in 3 to 5 fathoms, sand, sheltered from all but S.W. winds. It is high water, on full and change, at about 9^h; the tide rises about 4 feet.

The coast northward of Todos los Santos Bay consists of high, steep, rocky cliffs, rising abruptly from the sea, and composing a craggy, mountainous country, extending in a N.W. by N. direction for about 10 leagues to Point San Miguel, when it assumes a more northerly direction, or N. by W. $\frac{1}{2}$ W., for 6 leagues. The shores still continue to be of steep rocky cliffs, which in general rise, though not very abruptly, to a very hilly country, remarkable for three conspicuous mountains, entirely detached from one another, rising in quick ascent at a little distance from the shore, on a nearly plain and even surface. The northernmost of these presented the appearance of a table in all directions from the ocean; the middle one terminated in a sharp peak; and the southernmost in an irregular form. The centre one of these remarkable mountains lies from Port San Diego, S.E. by S., distant 9 leagues, and, at a distance, may serve to point out that port. They were called the Tables, or *Mesas de Juan Gomez*.—*Vancouver*.

At 6 $\frac{1}{2}$ miles W. by N. $\frac{1}{4}$ N. from Enseñada Point is Cape San Miguel, the coast between being bold, with cliffs 50 to 100 ft. high. A large field of kelp extends off this shore. *Cape San Miguel*, the northern limit of Todos Santos Bay, is a bold point 150 ft. high. From hence the coast trends N.W. $\frac{1}{2}$ W., 10 $\frac{1}{2}$ miles, to *Sal-si-puedes Point*, which is low and undefined. The coast between, which is lined with kelp, consists of alternate sand bluffs and rocky cliffs about 50 ft. high, the mountains rising to over 2,000 ft. a few miles inland.

Descanso Point is 16 miles N.W. $\frac{1}{4}$ N. of *Sal-si-puedes Point*, the coast between being generally sandy with an occasional rocky cliff, high hills rising immediately behind the beach. Eastward of *Descanso Point* is *Descanso Bay*, in the middle of which is *Sugarloaf Rock*, 15 ft. high, 3 $\frac{1}{2}$ miles S.E. by E. $\frac{3}{4}$ E. from the point; there is anchorage southward of it, and anywhere along the shore of the bay, in 8 to 15 fathoms, sand. At 6 $\frac{1}{2}$ miles E. by S. $\frac{1}{4}$ S. from the point is a small settlement, with some conspicuous sand-hills northward of it; small vessels frequently anchor near it.

From *Descanso Point* the coast trends 13 miles N.W. $\frac{1}{2}$ N. and then 5 miles N. by W. $\frac{1}{4}$ W. to the boundary monument placed on the line between the Mexican and United States territories, at the South end of San Diego Bay. The shore is generally bluff, 50 to 80 ft. high, and a few miles inland is a range of hills 400 ft. high, behind which rise the mountains. *Table Mountain*, 2,230 ft. high, about 7 miles N.W. by N. of *Descanso Point*, and *Sharp Peak*, 2,700 ft. high, a triple-peaked mountain a few miles southward of *Table Mountain*, are easily distinguished and form excellent landmarks. At 4 miles northward of *Descanso Point* are a ranch and an arroyo, off which are a few rocks.

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The CORONADOS, belonging to Mexico, lie about 7 miles off the coast, and were so named by Viscaino, in 1602, after one of the governors under Cortes, but they were discovered by Cabrillo in 1542. They are a group of high, bold, and abrupt rocks and islets, of which the largest is 15 miles S. by E. $\frac{1}{4}$ E. from Point Loma lighthouse, about 2 miles in length, by half a mile in breadth. It is a wedge-shaped mass, 674 ft. high, entirely destitute of trees, though in the rainy season it has abundance of gaudily-coloured wild flowers. There is anchorage in 8 fathoms, sand, about a quarter of a mile to the eastward of the centre of the islet, and there is a safe landing-place in a small cove near it. According to George Davidson, Esq., it is in lat. $32^{\circ} 23' 46''$ N., long. $117^{\circ} 13' 21''$ W. The smaller of the two prominent islets is $2\frac{3}{8}$ miles W. by N. $\frac{1}{4}$ N. from the larger; it is a huge barren rock, about 7 cables long, with a very sharp summit, 350 ft. high. There are numerous patches of kelp between them.

On the West and N.W. sides of the southern islet, and distant three-quarters and half a mile respectively, lie two smaller ones, or rather two masses of bare rock, 50 ft. high, the favourite resort of enormous sea-elephants. Excellent anchorage is said to be found in the vicinity.

In coming from the South this group affords a good mark for making San Diego, although before being up with them, Point Loma shows distinctly.

This completes the description of the West Coast of Mexico, and, as before stated, for the greater part of the information relating to the Coasts of Lower California and the Gulf, we are indebted to the directions drawn up from the surveys by Commander G. Dewey and the officers of the U.S.S. *Narragansett*.

CHAPTER IV.

THE COAST OF CALIFORNIA.

IN the commencement of the preceding chapter, some remarks are given which may be taken in connection with the present subject. Until May 30, 1848, the countries respectively denominated Upper and Lower, or New and Old, California, were under one dominion, subject to the same laws, and under the influence of the same social system; intimately connected with each other morally, and having the same origin in a political sense, their histories may be considered as identical. When, however, a new order of things became established, and Upper California was ceded to the dominion of the United States, while the Lower Peninsula remained an appendage to Mexico, a wonderful change took place in the importance of these two territories, not so much arising from the change of masters as from that great event of the present century—the discovery of gold in the basins of the rivers falling into the Bay of San Francisco.

The first discovery or exploration of this part of the American coast was made in 1540, under the orders of Don Antonio de Mendoza, the viceroy of Mexico, who despatched Francisco Vasquez Coronado by land, and Francisco Alarçon by sea, in search of the supposed Strait of Anian, which, it was said, communicated with the Atlantic Ocean. Alarçon reached the 36th parallel (South of Monterey), but was then forced to return. The same project was resumed in 1542 by Rodrigues de Cabrillo, a Portuguese in the Spanish service, who reached the latitude of 44°. His principal discovery was a projecting point in lat. 40½°, to which he gave the name Cape Mendocino, by which it is still known.

The Spaniards seem to have forgotten these discoveries, till, in 1578, Sir Francis Drake passed the Strait of Magalhaens, then scarcely known, and traversed the great ocean from South to North, reaching the N.W. coast of America in lat. 48° North. He then coasted the shore downwards, and discovered the harbour, now bearing his name, to the N.W. of San Francisco, where he made some stay. He here formally took possession of the country in the name of Elizabeth, Queen of England, imposing the name of New Albion on it.

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The expeditions of Drake, of Cavendish in 1587, and of Van Noort in 1598, gave rise to considerable jealousy with the Spaniards, who determined to colonize these coasts. Accordingly, Don Gaspar de Zuniga, Count de Monterey, the viceroy of Mexico, despatched Sebastian Viscaïno, in 1602, whose most northern important discovery was the harbour, which, in honour of the viceroy, he named the Puerto de Monterey. The Spaniards had founded several missions on the Californian Peninsula, as before mentioned, and the ruins of these great establishments still remain to testify as to their magnitude and importance. On June 25th, 1767, the Emperor Charles III. abolished the Society of Jesus (Jesuits) in Lower California, and gave their property to the Franciscan order. Sixteen of the monks of this latter fraternity landed at Loreto, in Lower California, in 1768, under the Visitador, Don Josef de Galvez; and soon after they established the presidios and missions of San Carlos de Monterey, and the same at San Diego, in such a way as to protect all the country, adding, as an intermediate point, the mission of San Buenaventura. In the founding of these missions, for which Don Vincente Vila set sail in January, 1769, the vessels met with the greatest difficulties from adverse winds; but they were overcome. All this, however, did not make known to the explorers the existence of the finest harbour of all, that of San Francisco, which was subsequently discovered by a *land expedition*, in 1770.

When the revolution in 1823 occurred, which separated California from Old Spain, a fresh order of things was established, and the country was deprived of their religious establishments; the consequent ruin of these once flourishing communities naturally followed, and nothing can be more deplorable than the subsequent accounts of their downward progress.

The result of the warfare between the United States and the republic of Mexico was the cession by the latter of the territories of California and New Mexico to the United States Government. The exchange of ratification of this treaty took place on May 30th, 1848.

Among the settlers who had introduced themselves into Upper California, after the revolution, was Captain Suter, by birth a Swiss, and who had been a lieutenant in the Swiss guards during the time of Charles X. of France. He had obtained a large grant on the Sacramento River, and fixed his abode and fortification at the head of the tide on the Sacramento, calling it New Helvetia. He constructed a water-mill here, and after one of the freshets to which the stream is liable, on examining the earth brought down by the waters, some particles of gold were picked up, the discovery being almost purely accidental. Further search was made, and an immense quantity of the precious metal, no doubt, was collected.* Ere long this fact acquired publicity, and immediately

* It is singular that the existence of *gold* was ascertained by Sir Francis Drake, for Hakluyt, who was with him, said, in 1589, "There is no part of the earth here to be taken up wherein there is not a reasonable quantity of *gold* and silver." Yet this traveller's tale remained unheeded for nearly two and a half centuries, till June, 1848.

almost the entire male population of California flocked to the gold region, being the pioneers for the vast influx from every part of the Pacific and neighbouring countries, increasing the population one hundredfold in the course of a very few months. We cannot trace out here the progress of the gold movement, which received its first impetus in 1848. This very singular chapter in the world's history has many illustrations in other places.

According to the report of Messrs. Wells, Fargo & Co., the total production of gold and silver in the States, &c., West of the Missouri River, including amounts from British Columbia and the West Coast of Mexico, amounted to about £15,930,321 in 1883, of which silver represented £9,839,511. Up to 1882 the famous Comstock silver lode alone had paid about £24,247,667 in dividends, since its discovery.

Besides its metallic treasures, much attention has lately been given to the cultivation of all sorts of grain and fruit, for which the climate of California is eminently suitable. Much of the grain and fruit is exported, there being large establishments at San Francisco for preserving the latter. It is estimated that 26,500,000 lbs. of fruits and vegetables were canned in the State in 1882. The culture of hops and the vine is also largely on the increase.

The population of California, a very mixed one, by the census of 1830 amounted to 864,686, of which 767,266 were white, and 97,420 coloured, the latter including 75,025 Chinese, an increase of 55 per cent. over the census return of 1870. In 1860 it was 379,994, being an increase of 310½ per cent. from 1850. Its area, according to the Report of the U.S. Surveyor-General in 1879, is 157,031 English square miles.*

Immediately after its accession to the United States measures were taken by the Government to commence a complete survey of the coast. Accordingly, in the autumn of 1848 a surveying party was organised for field work, and the schooner *Ewing*, under Lieutenant W. A. Bartlett, U.S.N., was despatched in 1849, and subsequently a general reconnaissance of the whole coast was completed. Commander James Alden published, in 1853, the results of this preliminary examination, and in 1858, Assistant George Davidson drew up a Directory for the Pacific Coast of the United States, and this useful work was revised and republished by the same zealous officer in 1869. This latter work has been followed hereafter, as it gives a complete hydrographical picture of the coast.

The Winds.—The following remarks are extracted from Mr. Davidson's work:—It has been advised to work close along shore to the northern ports during the summer N.W. winds, and take the chances of land breezes to make latitude, but the attempt will double the length of any voyage. Baffling light

* Much information respecting the Railways, and various towns on the Pacific coast, will be found in "Croft's New Overland Tourist and Pacific Coast Guide," published at Chicago.

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airs and calms frequently exist along the coast, while vessels several hundred miles off have strong N.W. winds. Moreover, along the coast we know that the current frequently sets 2 miles per hour from the northward, except very close under the shores. In our experience we never yet have met a wind off the land North of San Francisco, and very rarely, indeed, South of it, except in the region of the Santa Barbara Channel. As a general rule, it may be safely stated that the summer winds follow the line of the coast, nearly, and gradually draw towards and over the land. In winter, with winds from the southward, this is not so marked.

From April to October inclusive, the prevailing wind is from the N.W., changing to West in valleys opening upon the coast, but in no case so strongly as through the Golden Gate. During the summer the wind sets in strong about 10 a.m., increasing until nearly sunset, when it begins to die away. During its height it almost regularly brings in a dense fog, which, working its way over the peninsula, meets that already advanced through the Golden Gate, and envelopes San Francisco and the bay by sunset. As a rule, the breeze does not dispel the fog. If a fog exists outside, the wind is sure to bring it in, but the heated earth dissipates it for a time.

From November to March the wind is frequently from the S.E., blowing heavily, working round to the S.W., with a large and broken swell from the S.W., weather thick, rainy, and squally, the wind not unfrequently ending at N.W., with an ugly cross sea. During heavy south-easters the sea breaks upon the San Francisco bar, clean across the entrance, presenting a fearful sight. The sound can be heard at the anchorage in front of the city.

During some winters a hard "norther" will spring up and blow steadily and strongly from one to five days, with a clear blue sky, and cold bracing weather. Winds rarely blow from points between North, round by the East, to S.E.

The farther North we advance, the heavier blow the gales in the winter. The N.W. winds are not predicted by the barometer, but, from the S.E., almost invariably; the mercury falling 1 inch from its usual height of about 30 inches. When it begins to rise, the wind may be looked upon as soon to shift round by the West, and to decrease. Only in one instance during our experience has this failed, and that was off the Strait of Juan de Fuca.

On the tops of the mountains bordering the coast, light variable and easterly airs are frequently experienced whilst the N.W. winds are blowing freshly along the seaboard. Upon Sulphur Peak, in lat. $38^{\circ} 46'$, and 26 miles from the coast, we have had fresh breezes from the E.N.E., whilst the usual N.W. winds were prevailing off shore. On Ross Mountain, only 3 miles from the sea, and rising 2,198 ft. from the right bank of the Slavianska River, we found variable airs when strong summer winds were blowing below.

The COAST.—The monument marking the western initial point of the boundary between Mexico and the United States, is on the table bluff rising

from the low land South of San Diego Bay. It is an obelisk of white marble, about 20 ft. in height, and resting on a pedestal. It stands near the edge of the bluff, about 300 yards from the beach, and is plainly visible from the water. Its geographical position, as determined by the U.S. coast survey in 1871, is lat. $32^{\circ} 31' 58.46''$ N., long. $117^{\circ} 7' 32.37''$ W., or in time, $7^h 48^m 30.15^s$.

From the boundary the coast is low and flat, running N. by W. for about 7 miles, thence curving gradually westward, until it is nearly East and West at the entrance of San Diego Bay. There are high mountains in the interior of the country.

POINT LOMA is the southern part of the western boundary of San Diego Bay, and the termination of a remarkable narrow spur of coarse, crumbling sandstone, which rises South of Puerto Falso, or False Bay, and West of the town of San Diego, to the height of 300 ft.; and after stretching South for about $5\frac{1}{2}$ miles, gradually increasing in height to 422 ft., terminates very abruptly. A *lighthouse*, presently described, stands on this highest part. The peninsula is covered with coarse grass, cacti, wild sage, and low bushes.

The eastern side of the entrance to San Diego Bay is low and flat, covered with thick bushes and grass. It is called *The Island*, although a peninsula, being very narrow and low towards the head of the bay. On Ballast Point, at the base of the Point Loma ridge, are visible the ruins of the old Spanish fortifications, &c.

SAN DIEGO BAY.*—Next to that of San Francisco, no harbour on the Pacific coast of the United States approximates in excellence that of the Bay of San Diego. It is readily distinguished and easily approached, and a depth of 22 ft. can be carried over the bar, which is three-quarters of a mile East of the southern extremity of Point Loma, and between it and the tail of the Zuniga Shoal. The bar is about 600 yards across from the outer to the inner 5-fathoms lines.

In 1871, in reply to an inquiry of the San Diego Chamber of Commerce, Professor G. Davidson, Chief of the U.S. Pacific Coast Survey, stated that there had been no change in the depth on the bar since the survey of Dalrymple, in 1782, and as a rule there is less swell on it than on any other bar of the Pacific coast. The facilities for entering and leaving are considered good, at all ordinary seasons, for vessels drawing 22 ft., at high water. Large vessels can go about 7 miles up the bay, above Ballast Point at the entrance, the channel averaging about 4 cables wide between the 4-fathoms lines. There is less rain, fog, and thick haze, and more clear weather, in this vicinity, than at all points to the northward, causing the entrance to be less difficult to make and enter.—*Mercantile Marine Magazine*, August, 1871, p. 232.

† San Diego Bay was discovered by Juan Rodriguez Cabrillo, a Portuguese in the service of Spain, in September, 1542, and called Port San Miguel. It received its present name from Sebastian Viscaíno, who surveyed it in November, 1602.

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Vessels coming from the N.W. make the ridge of Point Loma as a long flat-topped island when about 25 miles distant. This appearance is occasioned by the bay to the S.W., by the low land to the N.E., and by the Puerto Falso at the North. By night the cape is shown by the lighthouse presently described.

A thick field of kelp lies along the western shore of Point Loma, the inner edge being about 1 mile off shore, and having a breadth of half a mile. The outer edge marks the line where the depth of water suddenly changes from 20 to 10 fathoms. The field commences off the bar at the entrance to False Bay, and stretches southward $2\frac{3}{4}$ miles South of Point Loma. Approaching the South end of Loma, along the outer edge of the kelp, pass through a partial break in it, and when the point bears N.E. by E., distant $1\frac{1}{2}$ mile, keep along the northern edge of the kelp in $4\frac{1}{2}$ fathoms, and about half a mile from the point. As soon as the point is passed, a long, low beach of shingle is opened, making out from the East side of the point, and forming a natural breakwater, formerly called *Punta de Guiranas*, or *Punta de los Guijarros*, by the Spaniards, but now designated as *Ballast Point*.

Round up gradually until Ballast Point is brought in range with the easternmost house of La Playa (distant 1 mile from Ballast Point, and on the same side of the bay), and be careful not to open more of the village, as the shoal called *Barros de Zuniga* stretches South from the East side of the entrance, parallel to the ridge of Point Loma, and distant only three-quarters of a mile from it. Between Point Loma and this shoal runs the channel, which is less than half a mile wide within the 3-fathoms lines. With the least swell the breakers show the position and extent of the shoal; and at low tides part of it is bare. It has been said that a rock, having but 5 or 6 ft. of water upon it, lies in the channel, its position being marked by a patch of kelp, which is, however, torn away in heavy weather; but the examinations of the Coast Survey have developed no such danger.

During the summer keep as close to Point Loma as the draught of the vessel will permit, and lay on the wind up to Ballast Point, off which 4 fathoms can be carried within a ship's length, with 10 fathoms in mid-channel, and a very strong current on the ebb and flood tides; the former setting over Zuniga Shoal. After passing Ballast Point, steer for La Playa, and anchor anywhere in from 4 to 10 fathoms, with good holding-ground. Inside the point, and about 250 yards N. by W. from it, is a shoal having only 12 ft. water upon it, in a line from Ballast Point to the westernmost house at La Playa; it is a quarter of a mile long. The shoals on the starboard hand, after entering, are plainly in sight, except at very high water. The channel, however, is buoyed, and cannot be missed. From La Playa to New San Diego, 4 miles distant, the channel curves to the right and contracts, but about 6 fathoms water may be carried that far. A mile or two beyond the town the bay becomes shoal, and filled

North Pacific.

with flats, yet a very narrow 3-fathoms channel runs close along the eastern shore, nearly to the head of the bay.

Coming from the South, run for the extreme end of Point Loma, until Ballast Point and La Playa are in range, as before, and follow the foregoing directions.

When inside the harbour vessels are perfectly safe, but during very heavy southerly weather the kelp is said to drive in such masses as to make vessels drag their anchors. We have never known such a case, and doubt if a vessel, with good ground tackle and proper attention, would suffer from this cause; and the holding-ground is excellent. In heavy S.E. weather the sea breaks over Ballast Point.

POINT LOMA LIGHTHOUSE.—This primary sea-coast light is less than half a mile from the southern end, and situated upon the highest part of the point, 422 ft. above high water. The building consists of a stone dwelling, with a low tower of plastered brick rising from the centre, from which is shown a *fixed bright* light, elevated 492 ft. above the sea, and visible 24 miles.

It is high water at La Playa (corrected establishment) at 9^h 38^m; springs rise 5 ft., and neaps 2 feet 4 inches.

From Ballast Point the bay runs about North for 1½ mile, and thence curves gradually to the eastward for 3 miles, to *New San Diego*; thence to the head of the bay S.E. 7 miles. The average width of the bay, after passing La Playa, is 1½ mile, but at New San Diego, after contracting to a little over half a mile, it again expands to about 1½ mile, with low shores and extensive marshes and flats.

The great drawback in San Diego Bay is the want of fresh water, which has to be brought from the river. Fresh provisions are readily procured here. Wood is scarce and not good. A vein of coal (lignite) has been discovered near San Diego, but it is stated to be of bad quality. The town has a population of about 5,000, and is the oldest in the State, having been first settled by the Jesuits in 1769. There is a branch railway to San Diego, from the Southern Pacific Railway between New Orleans and San Francisco; from San Diego it runs northward near the coast, till San Luis Rey is reached, where it continues inland to the junction at Colton.

There is a wharf here reaching into 23 ft. water; and two steam-tugs, belonging to the Railway Company, can be had for towing at reasonable charges. In 1882 four British ships, measuring 2,949 tons, arrived here with coal and iron, and two loaded with wheat for Great Britain.

False Bay.—At the North end of the ridge of Point Loma is an extensive shoal bay, called Puerto Falso, or False Bay. The bar at its entrance lies N. by W. ½ W., distant 5½ miles from the southern extremity of Point Loma; and having but 3 ft. water, it can be crossed only in the smoothest weather. The northern point of this bay is about 2 miles in length, very narrow, and covered with low sand dunes.

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To the North and West of this the shore becomes compact and unbroken, except by the valleys of San Luis Rey and San Juan Capistrano. The waters off this stretch of the coast Viscaïno called the Bay of Santa Catalina.

From the southern extremity of Point Loma the coast runs N. by W. for 22 miles, thence to Point Lausen (of Vancouver, 1793), forming the East point of San Pedro Bay, N.W. by W. $\frac{1}{2}$ W. nearly 60 miles.

San Luis Rey.—The mission of San Luis Rey, the largest in California, is situated in about lat. $33^{\circ} 17' N.$, long. $117^{\circ} 29' W.$, and the number of domesticated Indians formerly in its neighbourhood gave it the appearance of a large and thriving settlement. It was founded June 13th, 1798, stands in a rich valley from 1 to 2 miles wide, and is about 3 miles from the ocean, being separated therefrom by a range of hills. It is nearly in the centre of a section of country unequalled for salubrity and productiveness, but the scarcity of rain is an insuperable drawback. The mission is now a military post, but very few men are stationed there. As before stated, the railway from San Diego passes here. The anchorage is very much restricted and unprotected, and now seldom visited.

San Juan Capistrano is now a place of no importance, with an unprotected anchorage, rocky bottom, and bad landing. This mission, like all the others, is rapidly going to decay; it is very pleasantly situated in a grove of trees, whose luxuriant and diversified foliage, when contrasted with the adjacent shores, give it a most romantic appearance. Provisions and water may be obtained here. The anchorage is in lat. $33^{\circ} 27' N.$, long. $117^{\circ} 43' W.$

The bay, or rather the outer half-tide rock, on which Sir E. Belcher observed, is in lat. $33^{\circ} 26' 55'' N.$, long. $117^{\circ} 46' W.$ The bay is formed by a high cliffy head to the N.W., but terminates in low sandy beaches to the southward. The anchorage is foul under 5 fathoms, is unprotected, and the landing bad.*

From San Juan Capistrano the cliffy coast trends about 30 miles to W. by N. $\frac{1}{2}$ N. to Point Fermin, on the West side of San Pedro Bay; the space between is named *Bahía de los Tremblores*, into which run the rivers Santa Anna, Bolsas, and San Gabriel. *Santa Anna Lagoon*, or *Newport Bay*, lies about 12 miles to the N.W. of the mission; it is about 5 miles long, but has only a narrow entrance, with a dangerous breaking bar, over which it would be hazardous for any boat to pass. The River Santa Anna runs into it, but in summer it is said to frequently dry up before reaching the lagoon. At 8 miles

* The mission is situated in a fruitful-looking sheltered valley, said to abound in garden luxuries, country wines, and very pretty damsels, whence the favourite appellation *Juanitas*. I suppose, therefore, that they all assume this name. As many call here apparently, to my view, at risk of anchor and cable, I was induced to ask the master of a vessel who called upon me what brought him here? "It is only visited for stock, fruit, or vegetables," was his dry reply. Sir Edward Belcher.

East of Newport Landing, where most of the coasting steamers call, is the town of *Santa Ana*, with which it is connected by a good waggon road. *Santa Ana* is connected by railway with that from San Francisco to New Orleans. About 12 miles N.E. of it are some extensive mines of good coal. Farther to the N.W., in about lat. $33^{\circ} 42' N.$, is the landing wharf of *Anaheim*, a rapidly rising place; water is scarce here. The town of *Anaheim*, about 9 miles inland, has about 1,500 inhabitants, and has railway communication with Los Angeles.

SAN PEDRO BAY, or Wilmington.—This bay is well protected in every direction, except against the winter gales from the S.E. round to the S.W. During the spring, summer, and autumn, it is an excellent roadstead. From *Point Fermin*, which is the S.E. portion of high land forming the West side of the bay, the line of bluff runs exactly North and South for about 2 miles, being bold, and averaging 60 ft. in height. Near the point is a curious column of rock, named *San Pedro's Wife*, or the *Woman of the Period*.

LIGHTHOUSE.—On *Point Fermin* is a square light buff-coloured tower, 50 ft. high, showing a *flashing* light, with alternate *red* and *bright* flashes at intervals of 10 seconds, elevated 156 ft. above high water, and visible 19 miles.

Vessels coming from the westward through the Santa Barbara Channel make San Pedro Hill (1,600 ft. in height), forming the West side of the bay, as an island projected against the mountains to the southward and eastward. Approaching *Point Vicente*, which is the S.W. point of the hill, vessels can keep it close aboard, there being from 50 to 80 fathoms within a mile of the shore; round *Point Fermin* within half a mile, in from 6 to 10 fathoms, and open the small island called *El Moro*, or *Deadman*; run for that island, and when abreast of the landing (readily recognised by the houses on the bluff), about 1 mile North of *Point Fermin*, anchor in 3 fathoms, hard bottom, at half a mile off shore. Vessels must anchor a mile off to get in 5 fathoms.

Coming from the South with N.W. winds, beat in boldly until abreast of the landing; keep the lead going, and anchor anywhere in its vicinity. Do not approach the low shore, to the North and East of *El Moro*, closer than 1 mile, at which limit 4 fathoms water will be found.

In winter anchor farther out, and more to the southward, in order to be able to slip the cable and go to sea, should a heavy south-easter spring up.*

* Sir George Simpson, who visited it in his overland journey round the world in 1841-2, says:—"San Pedro is an open bay, which has no better claim to the character of a harbour than almost any other point on the coast, being exposed to both the prevailing winds, and being destitute of everything in the shape of a house, or even of a shed. Its only recommendation is, that it affords access to the Pueblo of *Nuestra Senora*, about 18 miles distant, which contained a population of 1,500 souls, and is situated in one of the loveliest and most fertile districts of California."

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The waters of the lagoon, inside of the low sandy beach, and a mile or more northward of El Moro, find their principal outlet between that island and the bluff point half a mile West of it. The entrance was very narrow and crooked, and only had 2 ft. water over the bar at mean low water. The United States Government has lately much improved it by constructing a breakwater, 6,700 feet long, from Rattlesnake to Deadman Island, and the channel is being deepened by dredging; vessels drawing 15 ft. can now cross the bar at high water. Inside the bar is a sheltered channel several miles in length, 400 to 500 ft. wide, and with 20 to 25 ft. water at low tide, shoaling to 12 ft. at its head.

The town of *Wilmington*, about 3 miles up the river, contains about 500 inhabitants. Below it is a long wharf, with warehouses, where vessels drawing 12 ft. can lie alongside the cars on the railway. Vessels drawing 15 ft. cannot reach the wharves at present, but are unloaded inside the bar, 2 miles below; it is intended to deepen the channel so as to admit sea-going vessels. The railway is a branch from Los Angeles of that from San Francisco to New Orleans.

Large quantities of timber and coal are landed here, the latter from British vessels coming to load grain. In 1882, 24 British ships, measuring 30,022 tons, arrived here with coal and iron, but they nearly all went to San Francisco or Portland for home cargoes. Vessels unable to cross the bar have to load and unload in the roadstead from or into lighters. Supplies are plentiful, and cheap, but water is rather scarce.

The astronomical station of the U.S. survey, at the bluff on the landing, is lat. $33^{\circ} 43' 19.6''$ N., long. $118^{\circ} 16' 3.0''$ W. It is high water, on full and change, at $9^h 39^m$; springs rise $4\frac{1}{4}$ ft., neaps $3\frac{1}{2}$ ft.

The town of *Los Angeles* or *Pueblo de los Angeles* (the country town of the Angels), having about 16,000 inhabitants, is 21 miles North by the railway from Wilmington, and is the centre of an extensive grazing, agricultural, and grape-growing country. The quantity of grapes and fruit generally shipped to San Francisco during the proper season is already enormous, and it promises to be an important wine-growing country; grain and wool are also exported. Regular communication is maintained with San Francisco and other ports by steamers and sailing vessels; by railway the former is 470 miles distant from Los Angeles.

The following remarks are by Mr. E. J. Molony, ship *British Merchant*, as given in the *Nautical Magazine*, December, 1880, pp. 1014—1016:—

For vessels bound to San Pedro the passage through Santa Barbara Channel is preferable, especially in summer, when the prevalent N.W. winds blow home along the coast. The channel is at all times more free from fogs than the space between and around the islands, and as the coast is bold, well lighted, and free from outlying dangers, the passage is a safe one. In the autumn and winter months the N.W. winds do not blow in the channel, calms and light

airs from the southward being common; then a vessel can take the outside route, passing to the northward of Catalina Island.

Small vessels, or steamers of light draught, can anchor within half a mile of the beach in 4 fathoms, or even cross the bar at high water, and anchor abreast of the village of San Pedro; but this should only be attempted in vessels drawing less than 15 ft., and with some local assistance.

In the roads the bottom is sandy ooze, and good holding ground; but there are large patches of rock, generally shown by the kelp, which sometimes grows in 20 or 30 fathoms of water, but always over a foul bottom. This must be by all means avoided, and in coming to an anchor sufficient space, clear of kelp, must be allowed around the ship to permit lighters to come alongside with facility. The residents at Wilmington assert that a vessel well found with ground tackle can ride out any of the winter gales, but doing so would be attended with a great amount of risk, as the place is quite open.

Vessels discharge their cargoes into large lighters, which carry from 100 to 200 tons, and are towed to and from Wilmington by a steamer. Ships having a steam winch can discharge with great facility, as empty lighters are constantly in attendance, and the water, owing to outlying beds of kelp, is perfectly smooth. Extra hands, or a steam winch for working cargo, can be hired at Wilmington. Supplies of all sorts are good, and very cheap.

The harbour of Wilmington is an extensive shallow inlet, the entrance to which has been increased to a depth of 17 ft. at high water by a breakwater, as yet incomplete; but the extent of deep water inside the bar is limited, at present only sufficient for a few coasting vessels. The channel from the entrance to the town, 3 miles above, is shallow and intricate, winding between extensive mud flats, dry at low water.

At Wilmington the Southern Pacific Railway Company have a good wharf and depôt, and here goods and passengers are embarked for the coasting steamers, which call here twice a week on their way from San Francisco to San Diego.

If the bar is deepened to admit large vessels (as is proposed), Wilmington must become an important seaport, and at present it has the advantage of being incomparably the cheapest place on the Pacific Coast.—*E. J. M.*

Monica Bay.—From Point Vicente the coast trends N. by W. $\frac{3}{4}$ W. for 16 miles; thence W. by S. to Point Dume in lat. $34^{\circ} 0'$ N., long. $118^{\circ} 48'$ W., thus forming a curve in the coast-line, known as Monica Bay. At its head is the port and town of *Santa Monica*, connected by railway with Los Angeles, 18 miles distant. It is a favourite bathing-place, and has a wharf into deep water for the coasting steamers.

Point Duma rises into a dome-like form, 202 ft. high. The land immediately behind it falls away, so that in making it from the West, it rises into view as

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an island close under the high mountains. Eastward of Duma the mountains spring directly from the water.*

From Point Duma to Point Hueneme the coast trends about W. by N. 22 miles, *Point Mugu* being about midway between. From thence to San Buenaventura, distant about 7 miles, the coast trends N.W. by N. At 2 miles West of Point Mugu is *Laguna Point*, close under which is very deep water, the 10-fathoms line running within 250 yards of the shore. Between Point Mugu and Buenaventura the coast is low, flat, and sandy, being the opening of the valley of Santa Clara, through which flows the Santa Clara River. This stream is nearly dry during the summer, and terminates in lagoons and marshes.

The eastern entrance to the Santa Barbara Channel lies between the eastern end of Anacapa Island and *Point Hueneme*, which is about half-way between Point Mugu and Buenaventura. From Anacapa, Point Hueneme bears N.E. by N. $\frac{1}{2}$ N., distant $10\frac{1}{2}$ miles, and a short distance southward (?) of it is *Port Hueneme*, where much barley is shipped.

The Lighthouse on Hueneme Point is a light buff-coloured tower, 46 ft. high, rising from the keeper's dwelling; it shows a *fixed bright* light for 1 minute, followed by six consecutive *flashes* of 10 seconds duration each, elevated 54 ft. above high water, and visible 12 miles.

Directly off Point Hueneme is found a remarkable example of a submarine valley, commencing with a depth of 10 fathoms, 400 yards from the beach, increasing to 50 fathoms in five-eighths of a mile, and to 113 fathoms in less than 2 miles. Its general direction is South, with a width of a mile, and bounded on either side by depths of 12 and 15 fathoms. The best landing is directly on the point; landing in the bight to the eastward and leeward is impracticable. Vancouver says this was called *Point Conversion* on old Spanish maps; he placed it in lat. $34^{\circ} 9'$, and retained the name.

* At the bottom of the bay, between Point Duma and Point Vicente, is a bitumen spring. In reference to this, when Vancouver anchored in a small bay 60 miles to the north-westward, he says:—"The surface of the sea, which was perfectly smooth and tranquil, was covered with a thick slimy substance, which, when separated or distributed by any little agitation, became very luminous, whilst the light breeze that came principally from the shore brought with it a very strong smell of burning tar, or of some such resinous substance. The next morning the sea had the appearance of dissolved tar floating upon its surface, which covered the ocean in all directions within the limits of our view, and indicated that in this neighbourhood it was not subject to much agitation." This singular fact, which might be turned to profitable account, has also been noticed by others:—"Off this part of the coast (near Santa Barbara) to the westward, Captain Sir Edward Belcher says, we experienced a very extraordinary sensation, as if the ship was on fire, and after very close investigation attributed it to a scent from the shore, it being much more sensible on deck than below, and the land breeze confirming this, it occurred to me that it might arise from naphtha on the surface."—*Voyage of the Sulphur*, vol. i, p. 320. This was before petroleum was thought of. It is mentioned again presently.

Buenaventura.—The mission of Buenaventura, situated at the foot of the dividing ridge of the valleys of San Buenaventura and Santa Clara, about half a mile from the shore, was founded March 31, 1782, in about lat. $34^{\circ} 15' N.$, long. $119^{\circ} 15' W.$ The climate is temperate, and the soil very fertile. There is excellent holding ground off Buenaventura in 10 fathoms, but the landing is not good; the 3-fathoms line lies about a quarter of a mile off shore.

At 15 miles westward of Buenaventura, on the coast, there is a rich deposit of sulphur, surface specimens of which have yielded sixty per cent. Around the locality are found ashes and scoria. The ground is hot, and the gas emitted is almost suffocating.

SANTA BARBARA.—From San Buenaventura to Santa Barbara the distance is 23 miles, and the bearing nearly W. by N. Santa Barbara is an open roadstead for all except northerly winds, which are unfrequent. On the West of the long low sandy beach is a bold bluff called *Point Filipe* or *Castello*, the hill rising behind which is called *La Vigia*.

The landing is on the beach about half a mile East of Point Filipe; the shore is very low and flat as far as the town, three-quarters of a mile distant, but gradually rises to the mission, which is a prominent object about 2 miles inland, elevated 200 ft. above the sea. The town is of considerable size, lying in the middle of an agricultural tract, running East and West, at the southern base of the Sierra Concepcion, but of limited breadth. The trade with San Francisco is not extensive; but this being one of the greatest stock-raising districts on the coast, vast droves of cattle pass through and are sent to San Francisco, and the mining districts. There is regular communication with San Francisco by steam and sailing vessels.*

The mission, founded December 4th, 1786, is one of the largest and best establishments of the kind in California, and in the gardens attached to it the grape and olive were cultivated with success.

Sulphur, in large beds and of superior quality, exists along the seaboard, and manifests itself in all the warm springs. Wood and provisions in abundance can be easily obtained here. Water is plentiful, but not so readily procured.

The Lighthouse at Santa Barbara consists of a plastered dwelling, with a low gray tower rising through the roof, situated 2 miles south-westward of the landing-place, and 183 yards from the edge of the bluff. It shows a *fixed bright* light, elevated 180 ft., and visible 17 miles. Approximate position, lat. $34^{\circ} 23' 35'' N.$, long. $119^{\circ} 42' 5'' W.$

* A large bitumen pit, about 8 miles West of Santa Barbara, empties directly into the ocean, and the bitumen, floating on the water, works against the summer or N.W. winds, even beyond Point Concepcion. Very frequently, in calm weather, a great extent of the surface of the channel becomes iridescent from the thin film of bitumen spread over it. The rocks along the shore, even to the westward of Point Concepcion, are covered with it.

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POINT CONCEPCION.

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Vessels coming from the westward first sight La Vigia, and, upon approaching the anchorage, keep outside the line of kelp (here nearly half a mile wide), gradually round the point upon which the lighthouse is situated, keep along the kelp until abreast of the town, and anchor in 7 fathoms; or pass through the kelp, and anchor inside it in $3\frac{1}{2}$ fathoms, hard bottom. In anchoring far enough off to get 9 or 10 fathoms, the bottom will be found sticky.

No dangers have been discovered in the kelp off this beach. With the least swell, the surf on the beach is a bad one, not falling square on, but cutting it at a sharp angle. In winter, vessels must anchor outside of the kelp, as the gales detach and drive it shoreward in such vast quantities, that, coming across a vessel's hawse, it helps to bring home her anchors.

The coast-line from Santa Barbara lighthouse to Point Concepcion lighthouse runs W. by S., 37 miles. A very short distance behind it is a range of rugged hills, over 2,000 ft. high, forming part of the *Sierra Concepcion* (sometimes called the *Sierra San Inez*), whose sides are sparsely covered with timber. The coast trail to San Francisco passes along the shore for a distance of 15 or 20 miles to the Gaviota Pass; thence inland to the Santa Inez valley, which runs nearly parallel with the coast. The rugged hills westward of the Gaviota Pass come close to the shore, forcing the traveller to leave the beach for their sea slope, the trail passing over steep ridges and down valleys.

POINT CONCEPCION.*—This characteristic and remarkable headland, about 220 ft. in height, lies at the western entrance to the Santa Barbara Channel. Once seen, it will never be forgotten. When made from the northward, or from the eastward, it rises as an island, but upon approach is found to be a high promontory, stretching boldly into the ocean, and terminating abruptly. The land behind it sinks comparatively low, and at first gradually, but soon rapidly, rises to the mountains, which attain an elevation of 2,500 ft. Between 300 and 400 yards South of the face of the cape is a large rock nearly awash, upon which some of the California steamers have struck in very foggy weather.

The **LIGHTHOUSE** on Point Concepcion stands on the extremity of the cape, and upon the highest part. Seen from the southward, it will be projected against the *Sierra de la Concepcion*, and appear about one-third of their height from the water. It is a primary sea-coast light, being a *revolving bright* light, showing a flash every *half minute*, elevated 258 ft. above the sea, and visible 23 miles. Its approximate position is lat. $34^{\circ} 26' 47''$ N., long. $120^{\circ} 28' 0''$ W.

About 180 ft. below the lighthouse is a steam *Whistle*, which in thick or

* Point Concepcion was discovered by Cabrillo in 1542, and called Cape Galera. It was afterwards named Punta de la Limpia Concepcion.

foggy weather sounds a blast of 8 seconds in every minute. The buildings are painted white. A *lifeboat* was to be stationed near the lighthouse.

"Next to the islands of the Santa Barbara Channel, Point Concepcion is the most prominent and interesting feature between San Francisco and the peninsula of Lower California. It has been very justly and appropriately termed the 'Cape Horn' and the 'Hatteras' of the Pacific, on account of the heavy north-westerners that are met with on coming through the channel, with a great change of climate and meteorological conditions; the transition being remarkably sudden and well defined.

"During some summer seasons the fog is almost interminable, but more particularly among the islands. For the space of six weeks, with clear days and nights at the cape, the islands have been invisible; rising, however, to an elevation of 1,000 or 1,500 ft., the observer plainly sees the summits of the islands over the sea of fog which envelopes them.

"When the fogs prevail, they generally roll in from seaward at sunset, and clear away about 10 o'clock next morning."—*G. Davidson*.

EL COXO.—At 2 miles East of Point Concepcion is the anchorage of El Coxo, off the entrance to the valley of that name. This anchorage is a better one than that of Santa Barbara, and the kelp is not so compact. In coming from the westward, after passing the point at a distance of about three-quarters of a mile, steer E. by N. and gradually round the bluff, which is a mile East from the point, giving it a berth of half a mile; run on a N.N.E. course for three-quarters of a mile, when the valley will open with a sand beach off it; anchor outside or inside the kelp, according to the choice of depth, 5 fathoms being obtained within a quarter of a mile of the shore, with hard, sandy bottom. Ten fathoms water will be found half a mile from the shore.

There is a large rancho at El Coxo, and it is one of the very best tracts for grazing. The beef has a finer flavour and more delicacy than any met with on the coast. The water is disagreeable to the taste. The primary astronomical station of the Coast Survey was on the top of the bluff, and between 250 and 300 yards W. $\frac{1}{2}$ S. from the mouth of the creek. Its geographical position is lat. $34^{\circ} 26' 56.5''$ N., long. $120^{\circ} 26' 33''$ W.

ISLANDS OF THE SANTA BARBARA CHANNEL.

The name of El Canal de Santa Barbara was given by Viscaino, in December, 1602, to the narrowest part of the channel lying East and West, and about 55 miles in length. Until the U.S. coast survey first examined in detail the islands lying off the main between San Diego and Point Concepcion, nothing accurate was known of their number, peculiarities, extent, or position.

It may not be here amiss to call attention to the abundance of mackerel found in the channel. The water has been seen fairly alive with them, and

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they have been caught by hundreds. Crayfish of a very large size are found in great numbers along the shores. The rainy season commences in the early part of November, and continues until the middle of March. The quantity of rain that falls does not average over 15 inches, but some seasons are marked by excessive drought. During the winter S.E. gales prevail, and sometimes during the summer months southerly weather will bring up heavy rain.

CORTES SHOAL.

Commencing at the southward, the first that claims our attention is the dangerous bank and rock called Cortes Shoal, bearing S.W. $\frac{1}{4}$ W. 46 miles from the S.E. end of the island of San Clemente. The extent of this bank has been sounded out carefully, and found much greater than the early examinations led us to suppose. Within the limits of the 50-fathoms curve the general trend is parallel with the islands of Santa Catalina, San Clemente, and San Nicolas, and it stretches about 15 miles to W. by N., from lat. $32^{\circ} 24' N.$, long. $118^{\circ} 59\frac{1}{2}' W.$, to lat. $32^{\circ} 32' N.$, long. $119^{\circ} 17\frac{1}{2}' W.$, but curves slightly to the S.W. It has an average and nearly uniform width of $3\frac{1}{2}$ miles. The nature of the bottom is hard, composed of white sand, broken shells, and fine coral at the S.E. portion, and sand with broken shells at the N.W.

The shoalest and most dangerous part is that known as *Bishop Rock*, lying 5 miles from the S.E. tail of the bank, and having but $2\frac{1}{2}$ fathoms of water upon it, so named from the ship which discovered it by striking on it. Around this danger the depth increases gradually, and in an extent of $2\frac{1}{2}$ miles in the general direction of the bank reaches but 15 fathoms. The geographical position of the rock is lat. $32^{\circ} 25\frac{1}{2}' N.$, long. $119^{\circ} 5' W.$, and from the N.W. end of the island of San Nicolas it bears S.E. by S., distant 57 miles; and from the S.E. end of San Clemente S.W. $\frac{1}{4}$ S., distant 46 miles.

The next shoal spot is one of 10 fathoms, about the middle of the bank, and of limited extent, being only half a mile square within the 15-fathoms curve. From the N.W. end of San Nicolas, it bears S.E. by S. $\frac{1}{4}$ S., distant 54 miles; and from the S.E. end of San Clemente S.W. $\frac{1}{4}$ W., distant 50 miles. From Bishop Rock it bears W. $\frac{1}{4}$ N., distant 5 miles. To the north-westward of this shoal spot the depth is nearly uniform at 49 fathoms for $7\frac{1}{2}$ miles, and between it and Bishop Rock the depth is uniform at about 43 fathoms.

Upon this bank the current is variable, frequently setting against the strong N.W. winds with a velocity of nearly 2 miles per hour, and producing at all times a heavy swell, and even in moderate weather breaking heavily upon the rocks. In passing over the bank at night vessels have been sensible of their proximity to it by the increased swell. In the detailed examination of 1856 it was found that the general set of the current was to the southward and eastward, and the greatest velocity $1\frac{1}{2}$ mile per hour; but no statement is made concerning the prevailing wind.

It lies in the direct route now followed by the Panama and San Francisco steam-ships, and was discovered by Capt. Cropper, of the steam-ship *Cortes*, in March, 1853. His position was determined by bearings upon San Nicolas and San Clemente, and was very close, being within a mile of the latest and best assigned place. He says that the water around it was in violent commotion, and thrown up suddenly in columns at regular intervals of four or five minutes. At first he thought he saw breakers, and occasionally the water broke as on a reef, but he became confident that the disturbance was owing to submarine volcanic agency. The specimens of the bottom negative this idea. He found his depth of water reduced from 42 fathoms to 9, which convinces us that he was on the shoal spot, about the middle of the bank, and saw the water breaking upon Bishop Rock, the same appearance that he witnessed, having been seen many times since by others, and the nature of the rocky bottom and depth of water supporting the assumption.

ISLAND OF SAN CLEMENTE.

This, like all the islands of the Santa Barbara Channel is high and bold, the southern end being the higher, and gradually falling to the northward; its greatest elevation is estimated at 1,500 ft. The general trend of the island is N.W. by W., its length 17 miles, with an average breadth of 2 miles, and 50 miles in circuit. The S.W. point of the island bears W. $\frac{1}{2}$ S. from Point Loma, distant 60 miles. At the N.W. end is a small indentation of the shoreline, forming an anchorage, having a width of three-quarters of a mile, by half a mile in depth, with soundings decreasing from 12 fathoms, on the line of a large rocky islet at the West side to a point E. by S. from it, to 4 and 5 fathoms close inshore. Kelp will be found in 10 fathoms, but the bottom is tolerably regular and hard. It is anything but a pleasant or safe anchorage in bad N.W. weather, and even in heavy southerly weather the swell must roll in disagreeably.

Under the S.E. end of the island anchorage may be had in the deepest part of the indentation, but the bottom is rocky and irregular. The S.E. point is a vast sandstone pyramid; and when it is brought to bear North, and the shore three-quarters of a mile distant, the anchorage will be W. by N. $\frac{1}{2}$ N., $1\frac{1}{2}$ mile, inside the kelp, in 10 to 15 fathoms, and one-third of a mile from the narrow sand beach at the foot of the cliffs. Outside of the kelp the depth ranges from 10 to 30 fathoms. This anchorage will afford protection in heavy N.W. weather.

The soundings around the island show a depth of from 36 to 130 fathoms close inshore, except off the N.W. point, from which a reef makes out about a mile. Neither wood nor water can be had here. The whole island would appear to be unfit for raising stock, on account of the want of water, but it is stated that thousands of sheep and goats thrive on it. Very few trees are found,

and the aspect is sterile. This island was discovered by Cabrillo in 1542, and called by him San Salvador, after one of his two vessels. The present name was given by Viscaino in 1602.

ISLAND OF SANTA CATALINA.

This island rises to a height of about 3,000 ft., and is remarkable for the great transverse break or depression, 5 miles from the northern end, running partly through it, and forming an anchorage or cove on each side. This depression bears S.S.W., $18\frac{1}{4}$ miles from Point Fermin. The land connecting these coves is very low, not over 30 ft.; but the hills rise up on each side 2,000 or 3,000 ft., and when sighted from the North or South the whole appears like two very high islands. The general trend of the island from its S.E. end is W. by N. $\frac{3}{4}$ N., $17\frac{1}{4}$ miles, with an average breadth of 4 miles in the southern part, and 2 miles in the northern, while the shore-line amounts to about 42 miles.

Pandora Cove, or Catalina Harbour.—The harbour or cove in the southern side, 5 miles from the northern end, is only about one-third of a mile in width, but its approaches are bold, and, so far as known, free from hidden dangers. To find it, run along the S.W. side of the island, and make the depression; then stand in for the opening, keeping a little left of mid-channel, until a third of a mile inside of the heads. From thence keep in mid-channel, until abreast of the long, low point on the right, and anchor in 5 fathoms, soft bottom. There is a depth of 3 fathoms inside of the low point, with hard bottom, but not room enough for a vessel to swing. If the wind is blowing from the N.W., vessels will lose it at the heads, and perhaps require to be towed in.

Raper Bay, or Isthmus Cove.—The anchorage on the North side of the depression is also small, with a reef in the centre, and two large outlying rocks. A steamer could run in on the West side of the rocks, and anchor off the low beach in 10 fathoms, when the reef would lie N. by E. from her, distant one-eighth of a mile. Small craft will here find protection from the prevailing winds, but experience difficulty in getting out, as there is always a swell setting in, and the wind blows in flaws and eddies on account of the high hills. Between the two points forming the anchorage the distance is half a mile, and the depth one-third of a mile.

The soundings around the island show deep water, from 19 to 75 fathoms, close inshore, with no outlying rocks except off the North cove. The shores are rocky, and on the southern side fearfully abrupt, but on the northern shore there are several indentations, where boats may land at almost any season. Deep and precipitous gulches are formed by the ridges of rock running diagonally across the island from N.E. to S.W., and occasionally a small valley varies the scene. A few settlers cultivate these spots, but their inconsiderable

extent precludes the realizing of anything beyond a sustenance. Some cattle and sheep are kept. About midway between the N.W. extremity of the island and the great break there is a spring of good water, and at the S.E. point good water has been obtained by sinking wells to a depth of 50 ft. or more, but in the intermediate places water found at the same depth is brackish. The island is covered with a growth of thorny bushes.

This island was discovered by Cabrillo in 1542, and called by him La Victoria, after one of his two vessels. It received its present name from Viscaino in December, 1602, when it was thickly inhabited by a people reported to be very ingenious, particularly in pilfering and concealing, some examples of which accomplishment they gave the Spaniards. Padre de la Ascension, who accompanied this expedition, gives very particular descriptions of a kind of temple to the sun, with images and idols found near the two coves.

ISLAND OF SANTA BARBARA.

This is one of the only two small islands of the Santa Barbara group. It lies on the line between the North end of San Clemente and the East end of Santa Cruz, and almost half-way between them. From the North end of Santa Catalina it bears W. by S. distant 23 miles. The extent of the island would not exceed 2 miles; its elevation at the highest part is about 500 ft., and the top has an area of about 30 acres, covered with soil, but no water is found, and not a vestige of wood. The shores are rocky and abrupt, presenting on the N.E. and South sides perpendicular cliffs, exposed to the full force of the ocean swell. Landing is at all times difficult and dangerous, the water around it is deep, and there are no outlying rocks. It is said to be much more enveloped in fogs than the neighbouring islands. Its approximate position is lat. $33^{\circ} 30' N.$, long. $119^{\circ} 2' W.$

ISLAND OF SAN NICOLAS.

Of the Channel Islands this is the most distant from the coast, as well as the driest and most sterile. It is about 600 ft. high, abrupt, and, like San Clemente, comparatively flat-topped, but falling to the southern end. The sides are bold and precipitous, and composed of coarse sandstone. Its general direction is W.N.W. and E.S.E.; its length is 8 miles, with an average and nearly uniform width of $3\frac{1}{2}$ miles, whilst the extent of shore-line is about 22 miles. The North point of the island bears S.W. by W. from Point Fermin, distant 65 miles; the line passing about 1 mile South of the island of Santa Barbara.

The soundings around the island show depths varying from 10 to 48 fathoms. At the North end heavy breakers make out $2\frac{1}{2}$ miles, and the

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soundings towards Begg Rock show irregular and rocky bottom. Breakers also extend from the southern point, to the distance of $1\frac{1}{2}$ mile according to Kellett. This is doubtless the case in heavy weather. Off the S.E. point, which is low and sandy, vessels may anchor in 10 fathoms, hard bottom, with a current running steadily to the southward, which makes the landing bad, as the surf cuts the beach at an acute angle. This point is in about lat. $33^{\circ} 13' N.$, long. $119^{\circ} 26' W.$ San Nicolas Island was not seen by Vancouver in 1793.

John Begg Rock is situated about 7 miles W. by N. $\frac{1}{2}$ N. from the N.W. point of the island of San Nicolas. It is about 40 ft. high, bold, and well defined, and can be easily seen at a distance of 10 miles. The soundings between it and the island indicate the existence of a submarine ledge connecting them. Its approximate geographical position is lat. $33^{\circ} 22\frac{1}{2}' N.$, long. $119^{\circ} 40\frac{1}{2}' W.$

It was named after the ship *John Begg*, which struck upon a reef near it, September 20th, 1824, and was nearly lost. The foul bottom is covered with kelp.

ISLAND OF ANACAPA.

This is in fact a curiously formed group of *three* islands, extending in a nearly E.N.E. and W.S.W. direction, their entire length being 5 miles. The West end of Anacapa is a peak 930 ft. in height, with a base of over 2 miles by three-quarters of a mile. This is separated from the middle island by a gap 10 ft. wide, through which boats can pass. The middle island is nearly 2 miles long by 500 yards wide, whilst the eastern island is little over a mile long, by 500 yards wide. The gap separating the middle and eastern islands is over 200 yards wide, but so completely filled with rocks as to be impassable for boats, which can, however, land on the North side of the island.

The West end of Anacapa is $4\frac{1}{2}$ miles E. $\frac{1}{2}$ N. from the eastern point of the island of Santa Cruz. The depth of water between these islands is 30 fathoms, with a very regular bottom, composed of grey sand, coral, and shells. The eastern end of the island bears S.E. $\frac{3}{4}$ E. from the Santa Barbara light, distant 28 miles, and from Point Huenceme or Conversion, the nearest point of the mainland, S.W. by S. $\frac{1}{2}$ S., distant 10 miles. Anacapa is in lat. $34^{\circ} 1' N.$, and between longitudes $119^{\circ} 20'$ and $119^{\circ} 25\frac{1}{2}' W.$ It has been recommended as a site for a lighthouse.

The island is composed of coarse, dark grey sandstone, very rotten and crumbling. The sides are perpendicular, and from 250 to 300 ft. high. The main peak is marked on the North side by several deep gulches, with almost vertical sides, running from the summit to the bluff. The whole formation is filled with innumerable cavities, giving it the appearance of an enormous blackened honeycomb. At the eastern extremity is found a very beautiful arch in one of the outlying rocks. The soil is loose and thin, producing only

a few dwarfed species of cactus, and a thick-leaved succulent plant. Not a drop of water is to be found on the island.

Anacapa is a place of great resort for the seal, sea-lion, and formerly of the otter, but the latter have been nearly all killed off. It was on this island that the steam-ship *Winfield Scott* ran ashore during a dense fog at midnight, December 2nd, 1853, in calm weather.

ISLAND OF SANTA CRUZ.

This island is the largest of the Santa Barbara Channel group, and lies off the coast opposite the town of Santa Barbara, at a distance of 20 miles. Its general direction is East and West, with a length of 21 miles, and an average width of 4 miles, while the extent of its shore-line is not less than 53 miles. On the northern side of the island and near the middle, the shore makes a moderately deep curve, forming a roadstead called *Prisoner's Harbour*, at the opening of a valley, where plenty of wood and water can be obtained. Anchorage may be had a quarter of a mile off the middle of the beach in 15 fathoms, sandy bottom; but there is no protection from the heavy swell setting in with a north-wester; it must, however, afford excellent refuge in S.E. gales.

Anacapa Bay is an open bay southward of San Pedro Point, the eastern point of Santa Cruz, where vessels can anchor in 13 or 14 fathoms, about one-third of a mile from the landing-place in the N.E. part of the bay, and here two buoys were moored. Kelp lines the greater part of the shore, and rocks extend off several of the projecting points.

The soundings around the island show deep water close to the shore, but there are rocks showing quite plainly 1 mile from the S.W. point, and others lying off the westernmost point.

In 1874 the U.S. surveyors discovered several other good anchorages and landing-places, and also some good springs of water. A well-marked submarine plateau extends off the North side of the island; there is a remarkable cañon off the S.W. side, averaging 300 fathoms in depth for the greater part of its length, with 40 and 50 fathoms on its seaward side.

The island is bold, and about 1,900 ft. in height. Its eastern part is extremely irregular, barren, and destitute of water, and the surface of the north-eastern portion is thickly strewn with large angular pieces of stone, as if broken with a hammer. Several species of cactus and some of the coarse grasses flourish, the latter giving sustenance to large numbers of sheep. Santa Cruz Island is composed of coarse, dark grey sandstone, crumbling and rotten, like that of Anacapa.

This island was called Juan Rodriguez by Ferrelo, who commanded the ships of Cabrillo after his death, which took place either in *Prisoner's Harbour* or in *Cuyler's Harbour* (Island of San Miguel).

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SANTA BARBARA CHANNEL.

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The group comprising Santa Cruz, Santa Rosa, and San Miguel, was discovered and called San Lucas by Cabrillo in 1542.

ISLAND OF SANTA ROSA.

This is the middle island of the group off the coast between Santa Barbara and Point Concepcion. Its general shape is that of a parallelogram, with the direction of the longer axis almost exactly East and West, and 12 miles in length; and the shorter North and South, giving it a width of 9 miles. The extent of shore-line is about 42 miles.

About a mile northward of the N.W. point of the island is a coral reef, with only 10 ft. water over it, which breaks in heavy weather only, and other dangers are believed to exist eastward of it. It lies $1\frac{1}{2}$ mile N. by E. $\frac{1}{2}$ E. from Finder Rock, off the N.W. point of Santa Rosa, and at three-quarters of a mile northward of it is a band of kelp, extending a quarter of a mile about East and West, with 12 to 15 fathoms in and around it.

There is a good passage between Santa Cruz and Santa Rosa, with a width of 5 miles, and one between it and San Miguel of $2\frac{1}{2}$ miles. Both passages are frequently used by the California and Panama steam-ships, but sailing vessels are cautioned not to attempt the San Miguel passage, as the light airs and calms under the lee of San Miguel Island, and the strong currents, combine to make it dangerous.

The soundings around the island do not show as deep water as round the others; on the N.E. and N.W. sides from 15 to 20 fathoms is found at 2 miles from the shore, but off the S.E. and S.W. sides the water is much deeper. The outline of the island is bold, but not so high as Santa Cruz, rising to a height of about 1,200 ft. The hills are rolling, and covered with coarse grass and bushes. It is said that no good harbours exist round its shores, which are steep and broken. The South point of the island is in lat. $33^{\circ} 53' N.$, long. $120^{\circ} 4' W.$ *

In *Becher Bay*, on the N.E. side, vessels can anchor, protected from westerly and southerly winds, in 7 or 8 fathoms, half a mile off shore, and nearly abreast a stream of fresh water. The shore is lined with kelp, extending into a depth of 6 fathoms, with shoal water inside it.

ISLAND OF SAN MIGUEL.

This is the western of the Santa Barbara Channel islands, its longer axis lying E. by N. and W. by S., 6 miles in length, with an average breadth of

* On some early Spanish charts the two western of the Santa Barbara Islands are called San Miguel and Santa Rosa (naming the western first), and upon the others Santa Barbara and Miguel. The present names and order are those adopted by Vancouver in 1793.

2½ miles. The extent of shore-line is 21 miles. Its western extremity is bold and narrow, gradually increasing in breadth until it attains 3½ miles. As seen from the south-westward, this end of the island appears to be several hundred feet in height, and composed of sand dunes, therein differing from all the other islands. The eastern face is nearly straight for 2 miles; the southern face is nearly straight along its whole length, with high abrupt shores; and from 30 to 37 fathoms water is found close inshore. Breakers extend about 1½ mile seaward of the western end.

On the N.E. side of the island is the small bay called *Cuyler Harbour*, off which lies a rock or islet, more than a quarter of a mile long, and several hundred feet high. From this islet to the head of the harbour the distance is 1½ mile, and the course S.W. Close under the western side of the harbour there is anchorage in 6 fathoms, secure from every wind except the North, which rarely blows here. The eastern part of the bay is full of rocks and reefs, and ought to be avoided. The reef in the middle of the bay bears S.W. from the West end of the islet, and is distant half a mile: it is the same distance from the West point of the bay, near the anchorage, and bears E. by S. from it.

At one-third of a mile S.W. by S. ¼ S. from the West end of the islet is a rock, and rocky bottom, and on the same line is another, half a mile distant. The southern part of the islet is about half a mile from the East shore of the bay. The bay shores are high, steep, and rolling, and covered with coarse grass and bushes. There is no water here in summer, but during the winter water drains down the gully at the beach in the middle and southern part of the harbour.

The western point of the island bears S. by E. ¼ E., distant 25 miles from Point Concepcion, and S.E. by S. ¼ S., distant 35 miles from Point Arguello.

Sheep and some stock have been placed upon San Miguel, but the success of the experiment has been doubtful, certainly unremunerative.

The mouth of the stream in the S.W. part of Cuyler Harbour is in about lat. $34^{\circ} 2' 16''$ N., long. $120^{\circ} 15'$ W. It is high water here, on full and change (corrected establishment), at $9^h 25^m$; spring tides rise 5 ft. 1 inch, neaps 2 ft. 9 inches.

San Miguel was discovered by Cabrillo in 1542, and Cuyler Harbour is supposed by some to be the bay in which he wintered. He died January 5th, 1543, having directed Bartolome Ferrello, his pilot, to assume the command of the expedition. He called the island Juan Rodriguez. It is sometimes called *San Bernardo*. Cuyler Harbour was named by the U.S. Coast Survey in 1852.

Richardson Rock, showing well above water, lies N.W. by W. ¼ W. 4½ miles from the western extremity of San Miguel: it bears S. ¼ E., distant 22 miles, from Point Concepcion, and S.S.E., distant 30 miles, from Point Arguello. A reef extends a short distance around it. *Wilson Rock*, a similar rock, lies

2½ miles N.W. by W. from Harris Point, the North extremity of San Miguel. Deep water is found around the rocks, and vessels may pass between them.

The COAST, from Point Concepcion northward.—The first headland to the northward of Point Concepcion is *Point Arguello* or *Arguilla*, distant 12 miles, and bearing N.W. by W. ½ W. The shore is bold and compact, curving slightly to the eastward between the two points, and the mountains immediately behind are not less than 3,000 ft. in height. At 200 or 300 yards off Point Arguello are some detached rocks, upon which the steamship *Yankee Blade* struck and was lost on the 1st of October, 1854, and 415 persons perished.

At 8 miles North of Point Arguello a small stream empties into the ocean; it is insignificant and unimportant. On former charts it is called the Rio de San Balardo, or San Geraldo, Bernardo, or Santa Inez. On the U.S. Coast Survey charts it is designated *La Purissima*, from the mission La Purissima Concepcion, situated a few miles inland.

The first point northward of Point Arguello is *Point Purissima*, off which a reef extends about one-fourth of a mile to the S.S.W. This is known on the coast as *Point Pedernales*, signifying Point of Flints, but now generally and erroneously printed "Pedro Nales." Formerly it was called *San Pedro Nolasco*. Near this point the S.S. *Edith* was lost in 1849. Between Points Purissima and Sal a small stream called the *Guyamas* opens.

Point Sal.—From Point Arguello N. by W. ¾ W., and distant 19 miles, is Point Sal, which is marked by streaks of yellow sand, except at the extreme point. The extremity is formed by high, round, black rocks, off which are several sunken rocks, extending half a mile to the southward and westward. This stretch of the coast is very similar to that behind Concepcion and Arguello, but after passing Point Sal, the mountains fall back, and the shore is formed of sand-hills. The general trend hence is North, until the shore commences sweeping westward to form the bay of San Luis Obispo, and the shores become high and abrupt.

SAN LUIS OBISPO.—This bay, about 17 miles northward of Point Sal, was discovered by Cabrillo in 1542, and called by him Todos Santos. It is an open roadstead, exposed to the southward, and even during heavy N.W. weather a bad swell rolls in, rendering it an uncomfortable anchorage. The landing is frequently very bad, and often impracticable, but the best place is at the mouth of the creek, keeping the rocks at its mouth on the starboard hand. Fresh water may be obtained at a small stream opening on the beach, half a mile West of the creek. In the coarse sandstone bluff between these two places are found gigantic fossil remains.

Off *Point San Luis*, which forms the S.W. part of the bay, are some rocks, and in making the anchorage vessels should give this point a berth of over half a mile, passing in 6 or 8 fathoms. Run on a N. by E. course, and anchor three-fourths of a mile from shore in 6 fathoms, sticky bottom; 4 fathoms can

be got about a quarter of a mile from the beach. In winter anchor far enough out to clear Point San Luis, if a south-easter should come up. During southerly weather landing is frequently effected at the watering-place when impracticable at the creek.

An automatic signal *Whistle buoy* is moored in about 14 fathoms, off the harbour, with Whaler Rock bearing N.W., northerly, distant $1\frac{1}{2}$ mile.

The distance from Whaler Rock, off Point San Luis, to the mouth of the creek is about $1\frac{1}{2}$ mile; from the same rock to a white rock bearing E. by N. $\frac{3}{4}$ N. the distance is $2\frac{1}{2}$ miles; and a black rock lies half-way between the white rock and the mouth of the creek. Whaler Rock, or Island, off San Luis Point, is in lat. $35^{\circ} 9' 28''$ N., long. $121^{\circ} 45'$ W. It is high water (corrected establishment) at $10^h 8^m$; springs rise 4 ft. 10 in., neaps $3\frac{1}{2}$ ft.

During the survey in 1874 a sunken rock, with 14 ft. over it, and marked by kelp, was found to lie 11 cables S.E. by S. $\frac{1}{4}$ S. from the end of People's Wharf at Avila, on the N.E. side of the bay, and 13 cables E. by N. $\frac{1}{4}$ N. from the shanty on Whale Rock.

On the West side of the bay is *Harford* wharf, extending into 12 ft. water, with some buoys off it, and on the opposite side People's wharf extends into 3 fathoms from the village of Avila. A railway extends from Port Harford to the town of *San Luis Obispo*, which takes its name from the mission of that name, founded September 1st, 1772, and situated about 10 miles in the interior, in the middle of an extensive and excellent grazing country. From San Luis Obispo the railway extends to the southward to Los Alamos, and is to be continued to Santa Barbara. Communication is maintained with San Francisco and other ports by regular steamers and lines of sailing packets.

To the northward of the bay of San Luis Obispo the *Monte de Buchon* rises to a height of 1,183 ft., and is readily distinguished in coming from the northward or southward.

At 16 cables S.W. $\frac{1}{4}$ W. from the shanty on Whaler Rock, off Point San Luis, is a small ledge of rocks with 18 ft. on its shoalest part, on which the sea seldom breaks, even in bad weather. At half a mile N.W. $\frac{1}{4}$ N. of this ledge is another, on which there are detached heads with 18 to 24 ft. water, on which the sea breaks in bad weather. Neither of these ledges is marked with kelp. To clear them, keep Sea Lion Rock (between Point San Luis and Point Buchon) its width open from the farthest point of land to the westward, until the nearest rocky bluff East of Avila opens eastward of Whaler Rock.

The U.S. Surveyors were informed by old otter hunters on this coast, that a sunken rock exists about 8 miles S.S.W. from Point San Luis, and furthermore that they had found kelp upon it in 4 fathoms. On the old Spanish charts an island appears laid down in that direction, but distant about 8 leagues. One of the Pacific mail steam-ships laid-to in a S.E. gale, and thick fog, off Point Concepcion, and, drifting to the northward, came unexpectedly upon a sunken rock, upon which the sea was breaking heavily. The commander supposed

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the vessel to be then off Point Sal, and had so plotted the rock upon his chart; but upon being informed of the alleged existence of a rock off San Luis Obispo, he was satisfied that he had been near it, but unfortunately had no opportunity of determining his position.

From Point San Luis the coast trends in a straight line W.N.W. for a distance of 8 miles, and close along the shore are several large rocks. Thence the coast trends abruptly to the North, running to the high conical rock called *El Moro*, distant 8 miles,—these two shores forming the seaward base of Mount Buchon.

From *El Moro* the shore-line gradually trends to the westward, thus forming a deep indentation or bay, called *Esteros Bay*. It was discovered by Cabrillo in 1542, and here he obtained wood and water. Behind *El Moro* are several lagoons or streams, and the high land retreats for some distance, leaving the shore low and sandy, while the North shore is rugged and guarded by rocks. The N.W. point of the bay is called *Punta de los Esteros*, and bears N.W. $\frac{1}{2}$ N. from the West point of Mount Buchon, distant 13 miles.

From Point Los Esteros to the western point of the anchorage of San Simeon, the coast runs nearly straight N.W. by W. for a distance of 15 miles. The shores are not so bold as to the southward and northward, and the mountains fall well back, leaving a fine rolling country of no great elevation, and well suited to agriculture.

BAY of SAN SIMEON.—This is a small exposed roadstead, but affords tolerably good anchorage during N.W. winds. The indentation of the shore-line forming the bay trends between N.N.W. to North for half a mile, and then sweeps away to the westward about $1\frac{1}{4}$ mile, gradually taking a S.E. direction. The land behind the bay is comparatively low and gently rolling, the high hills retiring well inland. This bay is supposed by some to be the "Bay of Sardines" of Cabrillo, where he anchored and landed in 1542.

Vessels coming from the northward may run boldly round the S.W. point, within a few hundred yards of the shore, in 8 or 9 fathoms, round up to North, and anchor anywhere off the sand beach in 5 fathoms, hard bottom, at a little more than a quarter of a mile from shore. The beach is half a mile long, stretching well out, and rendering the landing disagreeable with any swell; but in such cases it is usual to land at the western part of the beach. Eastward of the sand beach the shore-line is bluff, and guarded with rocks. Vessels from the southward must make short tacks close inshore, or they will assuredly miss it. The only sure marks for it are the *Piedras Blancas* with the lighthouse, as will be hereafter shown. The bay affords not the slightest refuge in southerly weather.

In making this harbour from the northward, vessels must sight the *Piedras Blancas* (White Rocks) 4 miles W. $\frac{1}{2}$ N. of the S.W. point of San Simeon. They are two large white-topped rocks, and nothing else like them is found on

this part of the coast. The geographical position of the outer and larger rock is lat. $35^{\circ} 39' N.$, long. $121^{\circ} 15' W.$

The Lighthouse on the point N.E. of Piedras Blancas is a conical white brick building, 90 ft. high, showing a *fixed* and *flashing bright* light, with a flash every 15 seconds, elevated 170 ft. above high water, and visible 19 miles.

About $1\frac{1}{2}$ mile North of Piedras Blancas, and inside the outer edge of the kelp line, is a rock, bare at low water, on which the barque *Harlech Castle* was lost. It lies nearly a mile off shore.

From Piedras Blancas the coast trends N.W. $\frac{1}{2}$ W. for a distance of 57 miles, in an almost perfectly straight line. At a distance of 18 miles from these rocks the above-mentioned bearing cuts a bold bluff and rounded point called *Punta Gorda*, off which, and for 2 or 3 miles along the shore northward, there are many rocks. This point is the Cape San Martin of Cabrillo. As there is one point under Cape Mendocino, more generally known as *Punta Gorda*, it is recommended that this point retain the name given to it by Cabrillo, especially as all his names have been cast aside.

Continuing on the same bearing, and at a distance of 49 miles from Piedras Blancas, is *Point Sur*, sometimes called *Lobos*, making out nearly half a mile, and on which it is proposed to erect a *lighthouse*. As seen from the North or South, at a distance of 11 miles, Point Sur appears as a large high, round-topped island; but upon approaching it a low neck of land is seen, connecting it with the main. It is in about lat. $36^{\circ} 20' N.$, long. $121^{\circ} 53\frac{1}{2}' W.$ In April, 1874, the S.S. *Ventura* ran upon some rocks about a mile northward of it. The highest peak of the range bordering the coast lies 6 miles in from Point Sur, and attains an elevation of 4,414 ft.

Still continuing on the same bearing, 57 miles from Piedras Blancas, and $7\frac{1}{2}$ miles from Point Sur, another slightly projecting point is passed, about a mile to the eastward of the course. Thence the course trends more to the northward, running N.N.W. for 8 miles to *Point Cypress*, and passing Point Carmel, the South point of Carmel Bay.

The mountains, which had fallen back behind Los Esteros, gradually approach the shore-line North of San Simeon, and about 10 mile North of Piedras Blancas they come down abruptly to the coast, and run parallel with it to Point Carmel, forming one of the boldest and most compact shores on this coast, and attaining a uniform elevation of nearly 4,000 ft. These mountains were called by Cabrillo the *Sierras Altas*, but at present the range is known as the *Sierra de Santa Lucia*. From their abrupt faces cascades may be seen falling from a height of 40 or 50 ft., directly into the sea.*

* On the opposite or eastern slope of the ridge is the valley of Salinas, through which the Rio Buenaventura flows. The hills are rendered much more fertile by their exposure to the fogs and mists of the coast, which supply them plentifully with moisture, and this is seen running in many rills down the hill-sides. The valley of Salinas is 50 miles in length,

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CARMEL BAY.—Between Point Carmel and Point Cypress, which are about 3 miles apart, lies the small, rocky, and unsafe bay of Carmel, at the southern extremity of which is a small cove, sufficiently landlocked and protected for small vessels. In the vicinity there is an extensive quarry of granite, and several small coasting vessels are employed for its transportation to San Francisco, but there is so little space that they are compelled to warp in and out by buoys placed at the entrance. Point Cypress, the North point of the bay, is low, and covered with cypress to the water, and is the first wooded point met with in coming from the southward. The upper branches of the trees are spread out by the influence of the strong prevailing winds, and present a flat umbrella-like appearance.

The *Mission del Carmelo* is situated but a short distance from the shores of the bay, and can be seen from the water in certain directions. From Point Cypress to Point Pinos the general direction of the shore is N. $\frac{3}{4}$ E., and the distance 4 miles.

POINT PINOS makes out as a low rounding point, bringing the pines, with which it is covered, within a quarter of a mile of the shore, off which the rocks make out a quarter of a mile, and the line of 3 fathoms nearly half a mile, when the depth suddenly increases to 10 or 15 fathoms, and at a mile reaches 40 or 45 fathoms. The 3-fathoms line follows the shore within a third or half a mile into Monterey, whilst outside of that line the depth increases as suddenly as off the point. Vessels should always give Point Pinos a good berth, as a very heavy swell almost invariably sets upon it. This point is the northern termination of the long and elevated range, called Sierra de Santa Lucia, extending southward, and forming the bold rocky coast-line to San Luis Obispo.

The **Lighthouse**, situated upon the N.W. part of Point Pinos, at the face of the growth of pines, is a gray granite building, 35 ft. high, and shows a fixed bright light, elevated 91 ft., and visible 15 miles. It is in lat. $36^{\circ} 37' 58.1''$ N., long. $121^{\circ} 56' W.$

and has an average width of 6 or 7 miles; the valley descends to the N.W., and at its lower end is contracted by the hills through which the river passes, a low and well-wooded bottom being formed on each side. The whole of it is well drained, and admirably adapted for stock farms. It may be called an open country covered with grass; the tops of the hills are covered with oaks, pines, and cedars.

The river having passed through a narrow range of hills, the valley again opens and now receives the name of La Soledad, which is 20 miles wide, and extends to the Bay of Monterey. The land on either side rises into undulating hills, and from these into mountains, some 2,000 ft. high. The valley of La Soledad is considered very fertile, the plains affording large areas of arable land, while the hills are covered with grass and groves of oak, and the mountains with trees of higher growth.

THE BAY OF MONTEREY.

Point Pinos forms the S.W. point of this bay, and Punta de la Santa Cruz (forming the western shore of the anchorage of Santa Cruz), the N.W. point. A line joining these two points runs N.W. by N. $\frac{1}{4}$ N. $19\frac{1}{2}$ miles, and the greatest width of the bay, near the mouth of Salinas River, is $9\frac{1}{2}$ miles.

From Point Pinos to the anchorage off the town of Monterey the course is E. by S. $\frac{1}{4}$ S., and the distance 3 miles. The shore towards the town is rugged, composed of granite, and covered with a heavy growth of fir; but to the eastward of the town is a long sandy beach, backed by sand dunes of slight elevation. For a distance of 10 miles along this beach the line of 3 fathoms lies at a distance of 150 yards off shore, the water deepening rapidly beyond that, and the bottom almost everywhere hard.

The only part of the bay in which vessels can anchor in security is near the southern part, off the town. To be protected from the sea it is necessary to lie at no great distance from the S.W. shore, whence, either at night or in the morning, the prevailing wind allows vessels to leave the bay. Notwithstanding north-westerly winds are common, there are few instances known of their being so violent as to risk the safety of well-found vessels. The soundings are regular, from 30 to 4 fathoms, sand and mud.

Vessels coming from the northward, bound to Monterey, follow the coast from Point Año Nuevo to Point Santa Cruz, then run well into the bay, but not too far, for fear of losing the wind, and to avoid the set of the heavy swell rolling towards the beach. Leaving Point Santa Cruz, and keeping on a S.E. by E. course about 15 miles, will bring vessels into 25 fathoms, and nearly 2 miles from the beach; thence a South course for 8 miles will bring them to the anchorage in 10 fathoms, and half a mile from the landing. These precautions are necessary, because Point Pinos, with the whole bay, is almost continually enveloped in a dense fog. Very frequently the coasting steamers have to run for the beach, and then be guided by the route to the anchorage.

A direct course from Point Año Nuevo to the anchorage is S.E. $\frac{1}{4}$ E., and the distance $36\frac{1}{2}$ miles. From Point Pinos to Point Año Nuevo the bearing is N.W. $\frac{1}{4}$ W., and the distance 34 miles.

By anchoring well in at the western side of the anchorage, vessels will avoid much of the swell that comes in with the heavy N.W. winds, but never sufficient to make any berth there dangerous. In heavy southerly weather Point Pinos breaks the swell, but the wind draws very strong over the anchorage. The water shoals from 15 to 3 fathoms in a distance of 300 yards, and the lead should be used to avoid running in too far.

When the California mail steamers stopped at Monterey they frequently ran outside of Point Pinos, or in very dangerous proximity to it.

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The town of Monterey presents a very pretty appearance as seen from the water. Immediately behind it the country rises in plateaux, diversified with hill and valley, and beautifully dotted with oak groves. It was the capital of California while under the rule of Mexico, and for some years after it became a state. The whale fishery* has been vigorously pursued at Monterey, during the season, usually from March to November. Regular communication is kept up with all parts of the coast by steamers and sailing vessels. It is connected by railway with the town of Santa Cruz and San Francisco, the latter 136 miles distant.

The end of the wharf abreast of the custom-house at Monterey is (approximately) in latitude $36^{\circ} 36' 17''$ N., long. $121^{\circ} 52' 27''$ W. It is high water, on full and change, at $10^h 12^m$; springs rise $4\frac{1}{2}$ ft., neaps $2\frac{1}{2}$ ft.

Following the shore from the town of Monterey, northward, it presents a uniform sand beach, running nearly North, backed by low dreary sand dunes, producing sparsely the coarsest grasses and bushes, and entirely destitute of fresh water. This waste extends to *Salinas River*, of which the great bend is reached at about $9\frac{1}{2}$ miles from Monterey, and only 100 yards from the beach; from Point Pinos it bears N.E., and is distant $8\frac{1}{2}$ miles. From this bend the river follows the line of the beach, just inside of the low sand dunes, for a distance of $4\frac{1}{2}$ miles, and there disembogues, at $12\frac{3}{4}$ miles N. by E. $\frac{3}{4}$ E. from Point Pinos. This river has been designated by a variety of names, as Buena-ventura, Monterey, and Salinas, but it is now generally known by the latter. From its mouth, which is only 60 yards wide at low water, to the entrance to the *Rio del Pajaro*, or San Antonio, the distance is $2\frac{1}{2}$ miles, the shore trending to the N.N.W. The entrance of that river bears N. by E., 14 miles from Point Pinos. From here the coast runs N.W. nearly straight to *Atos Creek*, a distance of 7 or 8 miles, and about 6 miles E. by N. of Santa Cruz, with the shore rocky and abrupt.

North of Salinas River commence rich meadow and table lands, affording to the settler spots unsurpassed for productiveness, even in the prolific state of California.

A remarkable submarine valley, similar to that off Point Hueneme, has been

* La Pérouse says, "I cannot express the number of whales with which we were surrounded, nor yet their familiarity; they blew every half minute within half pistol-shot of our frigate, and occasioned a very strong smell in the air. We had not known of this effect from whales, but the inhabitants told us that the water they spouted was impregnated with this unpleasant odour, and that it extended to a considerable distance."

Many whales were also seen by Sir George Simpson, in 1842, the bay being a favourite resort of that animal; the shark, the cod, and the sardine also abound; the last is sometimes thrown in millions on to the beach by westerly gales.

The whale has been known to burst among his human persecutors with the report of a cannon, and almost to suffocate them with the stench.

North Pacific.

discovered, and to some extent traced out in this bay. The head of the valley is five-eighths of a mile South of the mouth of Salinas River, and the 20-fathoms line is only a quarter of a mile off the beach, the depth increasing to 50 fathoms in the next quarter of a mile. At this distance from shore the 20-fathoms lines are three-eighths of a mile apart. The general direction of the valley for the next 2 miles is S.W. $\frac{1}{2}$ W., where we find a depth of 117 fathoms, and the 50-fathoms lines lie about five-eighths of a mile apart; thence the valley runs about West, reaching a depth of 175 fathoms in a mile, and 240 fathoms in $3\frac{1}{2}$ miles, with 42 fathoms less than a mile to the North of this. The soundings are not numerous enough to trace its outlines in deep water, but the indications are, that for 10 miles of its length it runs nearly S.W. by W. $\frac{1}{2}$ W., with no bottom at 315 fathoms. The only available boat-landing upon the beach of the bay shores is at the head of this submarine valley. There are no indications on the land of this peculiar formation, except that at its head the bay very gradually reaches its greatest easting.

The extensive valley, called the *Salinas Plains*, through which Salinas River flows, extends inland from the eastern part of Monterey Bay. It has been before alluded to on pp. 230-1 (*note*).

SANTA CRUZ HARBOUR.—This harbour or anchorage is at the N.W. part of the Bay of Monterey, and is of very limited extent. It is protected from all the winds from the northward, but exposed to the full sweep of the southerly gales, and many coasters have been driven ashore during the winter season. It is about three-quarters of a mile in depth northward, by $1\frac{1}{2}$ mile East and West.

Light.—At about 100 yards from the extremity of Santa Cruz Point is a white tower, 35 ft. high, rising from the keeper's dwelling, from which is shown a *fixed red* light, elevated 69 ft., and visible 14 miles. In approaching from the northward the light will not be seen until it bears about E. $\frac{3}{4}$ N.

Vessels coming from the northward, after leaving Point Año Nuevo, follow the coast-line on a general course E.S.E. for about 18 miles. The shore for this distance is abrupt, rugged, and moderately elevated, with a range of high hills, or mountains, whose summits in summer are all almost continually enveloped in fog. Skirting the shore at a distance of half a mile, a depth of from 6 to 10 fathoms can be carried; and upon making Point Santa Cruz, the top of which is moderately level for some distance back, 4 fathoms is obtained within a quarter of a mile of it; round up and run along in 5 fathoms until abreast of the beach, where good anchorage will be found half a mile from the shore. Vessels from the South in summer keep well into Monterey Bay, to escape the full force of the north-westers and the heavy head sea.

During the winter months anchor well out, so as to be able to clear the shore westward of Point Santa Cruz, in case a south-easter springs up.

Landing on the beach is generally disagreeable, as it extends out some distance, but boats usually land at the embarcadero, at the foot of the bluff in

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the N.W. part of the harbour. The beach is over half a mile in length, and between its eastern extremity and the bluff point empties the San Lorenzo River, a small stream running past the town and mission, which is situated a mile inland.

The country about Santa Cruz is exceedingly productive, and now thickly settled. A steamer runs regularly in the trade between this place and San Francisco, and numerous coasters find abundant freight from here and the Pajaro country to San Francisco, with which it is also connected by railway. The town has a population of about 3,000, and is a favourite bathing place.

The high mountain, N. 25° E., $12\frac{1}{2}$ miles from Santa Cruz, is named *Mount Bache*, and is 3,791 ft. high.

It is high water here at $10^h 18^m$; springs rise $5\frac{1}{2}$ ft., neaps $2\frac{3}{4}$ ft.

From Point Santa Cruz to Point Año Nuevo the distance is 18 miles, and the general direction W. by N. $\frac{3}{4}$ N., at first curving to the south-westward of that course, and then to the northward, until within 3 miles of the rock off Point Año Nuevo, when the shore curves well to the westward (for the last mile to the S.W.), forming an anchorage protected somewhat against the heavy swell from the N.W., and having a depth of 5 fathoms within less than half a mile from the shore, and from 10 to 15 fathoms at the distance of a mile.

Point Año Nuevo.—At a quarter of a mile from the point lies a black jagged islet, consisting of a sloping ledge of rocks covered with a stratum of yellow clay about 4 ft. thick, and this again covered with a mound of sand about 30 ft. high. Upon this it has been proposed to build a *lighthouse*. The point itself is composed of rolling hills of shifting sand, varying from 20 to 100 ft. in height, while behind them rises the Santa Cruz range of mountains. The coast trail which followed the beach from the southward here strikes up the hills behind the sand dunes. Steamers coming upon the coast from the southward in thick weather, always endeavour to make the land near Point Año Nuevo, and then follow the coast to San Francisco bar.

On the S.W. side of Año Nuevo Island is a steam *Fog Whistle*, which in thick or foggy weather sounds a blast of 10 seconds at intervals of 55 seconds.

From Point Año Nuevo the coast runs to the N.W. for about 5 miles to *Pigeon Point*, 2 miles beyond which is the rocky point called the *Punta de la Bolsa*. The high mountain, 13 miles N.E. $\frac{3}{4}$ E. of La Bolsa, named *Black Mountain*, attains an elevation of 2,809 ft. At 2 miles North of La Bolsa empties the *Piscador*, a small stream running through a valley of inconsiderable extent. For the foregoing 9 miles the general formation of the immediate seaboard is that of a table-land of three terraces, the lowest gradually sloping from the base of the second to the coast, which is exceedingly rocky and forbidding. The underlying stratum is sandstone.

The LIGHTHOUSE on the extremity of Pigeon Point is a conical white brick tower, 100 ft. high, from which is shown a *flashing bright* light every

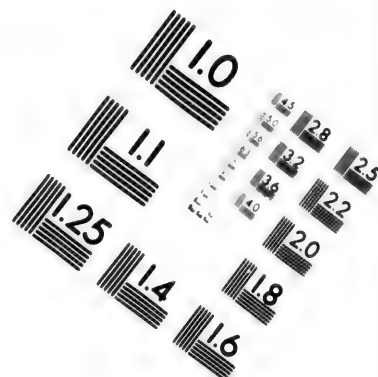
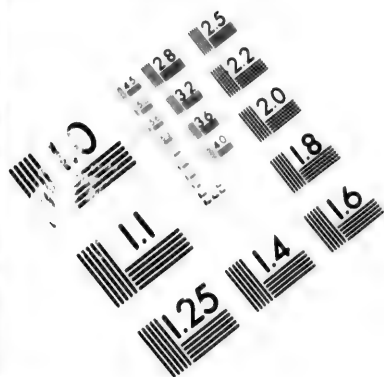
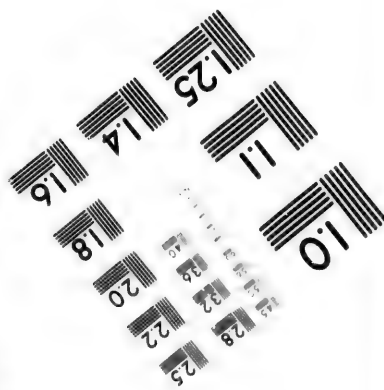
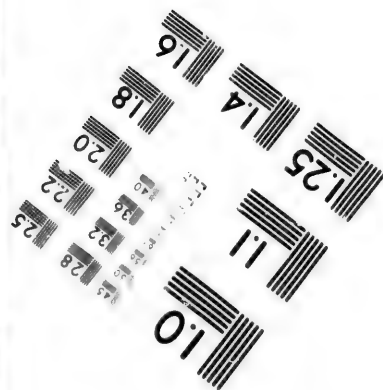
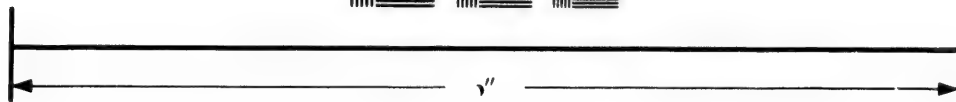
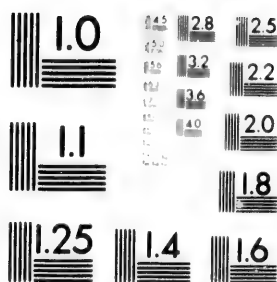
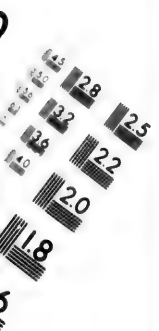


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10 seconds, elevated 150 ft. above high water, and visible 18 miles. At 100 ft. West of the lighthouse is a steam *Fog Whistle*, which in thick or foggy weather sounds a blast of 4 seconds, at alternate intervals of 7 seconds and 45 seconds.

From Boca Point to *Pillar Point* or *Punta de Corral Tierra*, forming the S.W. point of Half-moon Bay, the general direction is N.W. by N. $\frac{1}{2}$ N., and the distance 18 miles. At $3\frac{1}{2}$ miles above the Pescador opens the *San Gregorio*, another small stream, and $2\frac{1}{2}$ miles still further is the *Tunitas*. The seaboard between the valley of the Pescador and that of the San Gregorio undergoes a striking change both in the character of its topography and its geology. Instead of the table-land we meet with a spur of the coast mountains running into the sea, and having an elevation of 600 ft. within a mile of it. The shore-line and the coast generally present a very rugged and broken appearance, occasioned by the deep gulches cut through to the ocean.

HALF-MOON BAY.—This anchorage is 6 miles S.S.E. from Point San Pedro, and 18 miles S. by E. from the Golden Gate. The south-western point of the bay is formed by a bluff table-land, about 160 ft. in height, called the Corral de Tierra, 325 yards South of which stretches a number of black rocks, which show as one when seen coming up the coast, but as three or four when approached from the N.W. The largest is nearly as high as the bluff, and locally known as *Sail* or *Pillar Rock*. The point is known as *Pillar Point*, and from its S.E. extremity rocky and foul bottom, marked by kelp, extends S.E. $\frac{1}{2}$ E., seven-eighths of a mile, dropping suddenly from 14 ft. to 5 fathoms. This is the inner reef, and makes the bay available as a summer anchorage. At $1\frac{1}{2}$ mile S.E. from the same part of the point, a narrow ledge of rocky bottom, one-third of a mile long, and marked by kelp, stretches in the same general direction; its S.E. extremity was marked by a *black buoy*. The passage between this outer and the inner reef is three-quarters of a mile wide, with rocky and uneven bottom, from $3\frac{1}{2}$ to $10\frac{1}{2}$ fathoms. These ledges lie parallel with the coast mountains, and with the shore-line, from which the outer one is distant $1\frac{1}{2}$ mile.

From the eastern extremity of Pillar Point the shore runs N.W. by N. for a quarter of a mile, to a short wharf; then N.E. for three-quarters of a mile, curving to the eastward and south-eastward in a long bend for $2\frac{1}{2}$ miles to the mouth of the *Arroyo de los Pillarcitos*, down which comes the only road crossing the peninsula of San Francisco, between the Laguna de Mercedes and Santa Cruz. The highest part of this road, which crosses a depression of the peninsula, is near the Coast Survey Station ridge, which is 1,093 ft. above the ocean, and but a few feet higher than the road. The outer reef is nearly abreast of the Pillarcitos, from which the coast runs South 4 miles to *Miramontes Point*, which is S.E. $\frac{1}{2}$ E., 5 miles from Pillar Point; thence to the mouth of the Tunitas the distance is 4 miles S.E. The greatest extent of the bay may be

said to be between Pillar and Miramontes Points; but the part near the former only is available.

The soundings between the rocky ledges and the shore are quite regular, decreasing from 9 to 3 fathoms, at less than a quarter of a mile from the beach, with sandy bottom. The passage to the anchorage is between the inner and outer reef, with the high, bare-topped mountain bearing about N.E., and in line with a house known as Widow Wood's. This bearing also leads up to *Amesport Landing*, a wharf reaching into 6 ft. water, a short distance from the house. This mountain is steep, with straggling redwoods on its flanks, and the summit bare. It is locally known as *Bald Pate*; but on the Spanish grants as *Cumbra de las Auras*. When inside the reefs, beat up until Pillar Point bears about S.W., distant half a mile, and anchor in $4\frac{1}{2}$ fathoms, hard sand. With southerly light winds a heavy swell sets in; but upon the approach of heavy S.E. weather, it is necessary to go to sea.

The mass of redwoods cresting the mountains of the peninsula ceases abruptly abreast of Miramontes, and only stragglers are seen to the northward. They are a good mark for recognising this part of the coast when coming in from sea.

Around Half-moon Bay is a limited extent of agricultural country at the seaward base of the mountains, and small coasters carry the produce to San Francisco.

About 1 mile along the coast to the north-westward is a small boat harbour, 100 yards wide, formed and protected by outlying rocks, and having $3\frac{1}{2}$ fathoms in it, used as a whaling station in the autumn months.

At $2\frac{3}{4}$ miles N.W. by N. of Pillar Point is *Montara Point*, on which is a steam *Fog Whistle*, which in thick or foggy weather is sounded for 5 seconds, followed by an interval of 25 seconds, and then a blast of 10 seconds, followed by an interval of 10 seconds. Point San Pedro lies $3\frac{1}{2}$ miles to N. by W. $\frac{1}{2}$ W.

Point San Pedro lies N.W. by N. $\frac{1}{4}$ N., 30 miles from Point Año Nuevo, and S. by E., 11 miles from Point Lobos, at the entrance to the Golden Gate. It is a black, bold, rocky promontory, over 500 ft. high, having a high, large, jagged rock at the northern part, and is a prominent and excellent mark for making the entrance to San Francisco. The principal rock is nearly 100 ft. high; its South face is white, and shows the line of stratification plainly. From the West the dip of the strata shows about 60 degrees to the northward. It is connected with the main by some low rocks. Half a mile to the N.E. of the point is the valley of San Pedro, from which the point takes its name. From Point San Pedro the whistle buoy off the bar of San Francisco is distant about $11\frac{1}{2}$ miles to N.W. $\frac{3}{4}$ W. A *lifeboat* is stationed on the coast between Point San Pedro and Point Lobos.

The range of mountains forming the north-eastern shore of Monterey Bay, and extending to Santa Cruz and Point Año Nuevo, is called Santa Cruz.

Thence northward to the Golden Gate, and forming the peninsula of San Francisco, by bounding the bay on the West, the mountains are known as the San Francisco or San Bruno range.

SAN FRANCISCO.

The port of San Francisco was discovered as late as the year 1769, and that, too, not by the obvious mode of such an expedition, but by one overland. Perhaps one reason why it had been so overlooked by navigators is, that its narrow entrance is so frequently hidden by fog. In 1767, when the Jesuits were replaced by the Franciscans, the Viceroy of Mexico, the Marquis de Croix, finding that England and France were taking an interest in these countries, as evidenced by the expeditions of Cook and Bougainville, and that Russia, too, was steadily progressing from the North, proposed to the ecclesiastics the colonization of this territory. Accordingly it was divided into districts, and missions were planned for San Diego and Monterey, the only two ports then known to exist in the upper province. Three vessels were despatched from San Diego, but were eminently unfortunate, from the fact that the N.W. or opposing winds blow during three-fourths of the year. Under these circumstances the remainder of the distance was undertaken by land, and though the explorers did not recognise what is now Monterey, they made the far more valuable discovery of the inland sea to which the name of the patron saint of their order, and of sailors in general, was given.

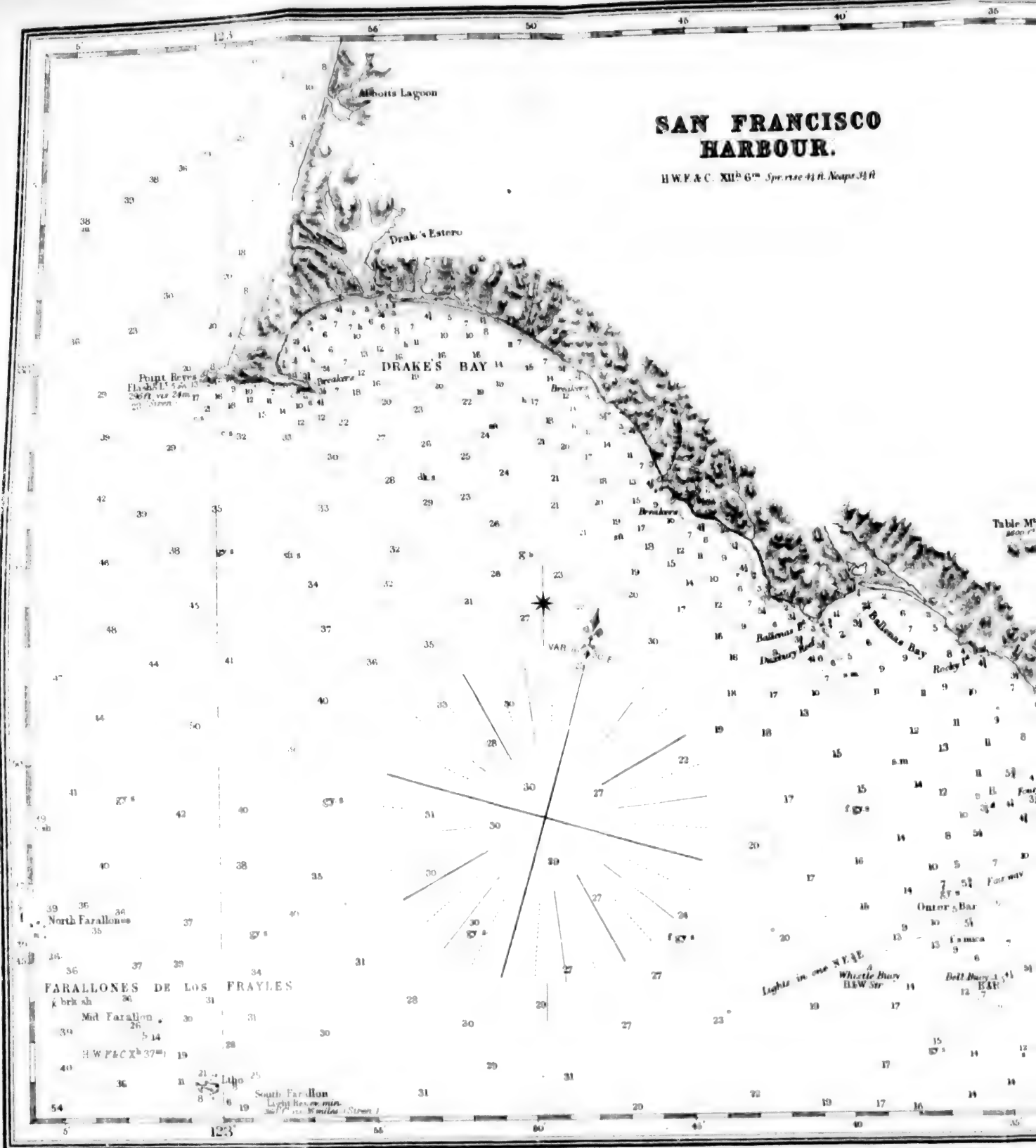
The mission was founded, and its progress had but comparatively little to do with the external world, and this little commercial importance was all but annihilated by the revolution in 1836.

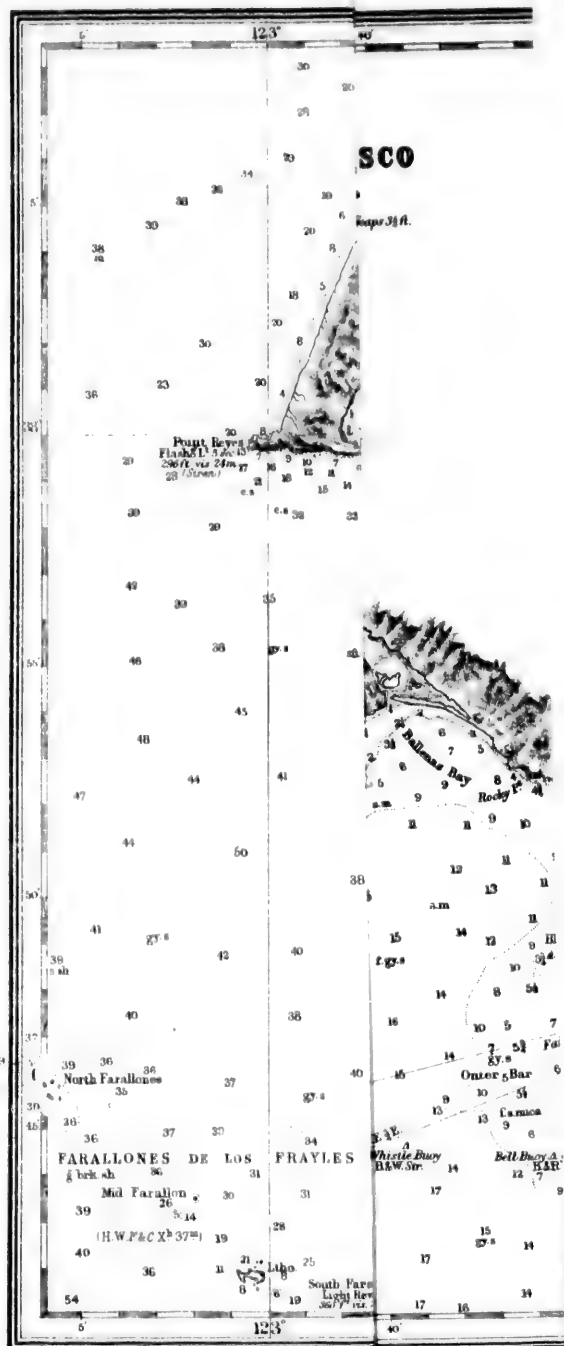
When Capt. (afterwards Rear-Admiral) F. W. Beechey surveyed the harbour in 1828, the place had but a few wretched adobe houses at Yerba Buena, occupied by indolent half-breeds, with not the slightest indication of the wonderful capabilities which were soon after to be developed. History affords no example of such a sudden rise in importance as California. Scarcely a month had elapsed after its annexation to the United States before the gold discovery by Capt. Suter and others was made, and very soon after the desolate harbour of San Francisco became crowded with shipping, bringing an immense influx of gold-seekers, and the ships, three or four hundred in number, laid there, deserted by their crews, and in some cases by their captains also. But this influx of people has left behind it the permanent advantages of a settled population, and there can be no doubt but that San Francisco, the Queen of the Pacific, is destined to be one of the most important centres of civilization and commerce that the world possesses.

Besides the immense territory of which it is the commercial and political

SAN FRANCISCO HARBOUR.

H.W.F. & C. XIIth 6th Spr. 1856 44 ft. Neaps 34 ft





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capital, and its vast powers of production, it will command the commerce of the North-east Pacific, and with it also that between the United States and China, Japan, &c., and the numerous lines of immense steamers which now sail to and from this port as a centre is one of the wonders of the present century. There are regular services of mail steamers to New Zealand and Australia, China, Japan, and Honolulu, also to the ports on the West coast of Northern and Central America. This commercial importance has been enormously increased by the trans-continental railways,* a very few days sufficing to connect this most remote part of the world with European trade and travel. In 1867 its population amounted to 131,000. By the census of 1880 it had increased to 233,066, and it now stands fourth among the cities of the Union in regard to the value of its foreign imports, and ninth in point of population.

In 1883 the total value of foreign merchandize imported into San Francisco by sea amounted to about £7,538,542, of which £885,000 came from Great Britain; and of the remainder, £3,831,875 came from Japan and China, chiefly in raw silk and tea. The exports by sea for the same year, consisting mostly of wheat and flour, amounted to about £9,003,479, of which £5,447,292 went to Great Britain; this is exclusive of gold and silver, £2,235,281 in value. The latter items show a great falling off as compared with former years.

In 1883, 806 vessels, with a total tonnage of 923,249, entered here from foreign ports, of which 320 vessels, 485,793 tonnage, were British. Great Britain still heads the list of countries from whence San Francisco imports coal, the quantity amounting to 174,200 tons in 1883; then follow Seattle, 167,600 tons, Australia, 162,200 tons, Vancouver Island, 120,500 tons, &c.; the total amounting to 895,900 tons.

"The charges for pilotage and towage are excessive; the latter has been for some years a monopoly in the control of one company, but towboats are being built by a new company, composed of leading merchants and shipowners, and will be used truly in opposition to the monopolists. Heretofore all opposition has been bought off. The Shipowners' and Shipmasters' Association are pre-

* The act creating the first Pacific Railway Company passed in 1862. The company were bound to complete their line at the rate of 100 miles a year; they completed it at more than three times that rate, at 2 miles per day at one end and $1\frac{1}{2}$ mile at the other, as much as 10 miles having been laid and completed in one day on the Central Pacific line. It was finished at the end of 1869. A good account of the progress of this marvellous undertaking is given in Dr. Bell's "New Tracks in North America," 1869. The distance from New York to San Francisco, by the railway, is 3,296 miles, and in 1877 this distance was covered by a special train in about eighty-four hours; it usually takes a week.

Since the completion of the above line, other trans-continental railways have been constructed. The southernmost is the Southern Pacific Railway, completed in May, 1883, connecting San Francisco with New Orleans, on the Mississippi River, a distance of 2,495 miles. The Northern Pacific Railway has its western terminus at Portland, Oregon, and from thence the Oregon and California Railway runs to the southward, and is to be extended to meet the line going northward from Sacramento.

paring a bill to present to the legislature now in session, reducing the rates of pilotage considerably.

"The construction of a sea wall or quay, 4,500 ft. in length, has been of great advantage to the port. Vessels of large draught can load and discharge alongside, and the erection of sheds on it, 2,000 ft. in length, affords every facility for the efficient handling of grain, which is allowed storage for fifteen days."—*Mr. Consul Booker, 1882.*

At Hunter Point, about 4 miles S.E. from the central part of the city, is a graving dock excavated in the solid rock; it is 450 ft. long, with an entrance 90 ft. wide, admitting a vessel drawing 22 ft. at mean high tide. The charges range from 32½ to 25 cents per ton per day for steamers, according to size, the latter charge being for vessels of 4,000 to 6,000 tons. Sailing vessels over 500 tons pay 40 cents per ton for the first day, and 20 cents per ton each day following. There is also a floating dock close to the dry dock, capable of taking a vessel of 1,400 tons, and another smaller one in the northern part of the harbour.

San Francisco is ill-placed, as far as mere building facilities are concerned. When the first houses were built in 1848 and 1849 they stood on a strip of beach around the Cove of *Yerba Buena*, and at the foot of the steep and lofty sand-hills. Dunes and cove have disappeared together; the hills have been shot bodily into the bay, and the former harbour is now the business quarter of the city. One great danger on this coast all its cities share in common; several times within the present century the spot on which San Francisco stands has been violently disturbed by subterranean forces.

The Contra Costa range is unbroken but by the single gap of the Golden Gate, and through this opening the cold winds rush in a never-ceasing gale, spreading fan-like as soon as they have passed the Narrows. Hence it is that the Golden Gate is called the "Keyhole," and the wind the "Keyhole Breeze." Up country they make it raise the water for irrigation. In winter there is a calm, and then the city is as sunny as the rest of California.—(Sir) *C. Wentworth Dilke, M.P., 1868.*

Although the entrance is easy, facilitated as it is by the excellent lights and buoys which define its prominent points, or point out its few dangers, we give unabridged the directions drawn up by the U.S. Coast Survey officers in 1862, modified, of course, by the changes which have since been made.

The **GOLDEN GATE** is the entrance to the bay, and presents the character of a great cleft or fissure in the sea-coast range of mountains, thereby connecting the Bay of San Francisco with the Pacific Ocean. In approaching it is difficult to imagine that a deep channel lies ahead, so clear is the atmosphere and so well defined the Contra Costa Mountains behind the bay. Both shores are bold, broken into points, and rocky; but the northern is much the bolder, rising almost perpendicularly from the water, attaining an elevation of about 1,000 ft. but a short distance back, and in 7 miles rising to 2,600 ft.

On the South side, between the points, are stretches of low beach; the hills are undulating and of moderate elevation, increasing very gradually in altitude to the southward, and reaching a height of 1,250 ft. in about 6 or 8 miles.

Point Bonita.—The North head of the entrance is formed by this point, a narrow, precipitous, rocky cape, nearly 300 ft. high, and stretching from the old lighthouse about a quarter of a mile to the S.E. Behind it the mountains rise rapidly to an elevation of 1,500 ft. During the dry season the deposit of sea-birds accumulates in such quantities on the ridge outside the lighthouse, as to make the bluff show white, but the first heavy rain carries it off, and then throughout the rainy season the point exhibits its natural appearance. There are no dangers off the point, the line of 3 fathoms rarely extending 300 yards from any portion of it. When the clipper ship *San Francisco* was lost on this head, we are told that she first struck the bluff inside the head; was carried by the currents around the point, and then cast ashore on the outside. From 5 to 6 fathoms can be found on every side within a fifth of a mile of the point.

The Lighthouse on the S.W. extremity of Bonita Point is a white tower, 21 ft. high, showing a *fixed bright* light, elevated 124 ft., and visible 14 miles. About 90 yards N.E. of the lighthouse is a *Fog Siren*, which in foggy weather is sounded for 4 seconds at intervals of 35 seconds. The lighthouse is in lat. $37^{\circ} 48' 48''$ N., long. $122^{\circ} 31' 44''$ W., and from it the lighthouse on Fort Point bears E. $\frac{1}{2}$ N., distant $2\frac{1}{2}$ miles.

The old lighthouse is situated about a quarter of a mile from the extremity of the point, and consists of a brick tower painted white. From seaward it is seen projected against the dark, high hills behind it, and in clear weather is a very plain object.

POINT LOBOS, the South head of the entrance to San Francisco Bay, is 375 ft. high. Upon the round-topped hill behind the point is erected a large frame building for a telegraph station, whence the electric wires run to the City of San Francisco. The first telegraphic message transmitted on the Pacific coast was over these wires. About 3 miles eastward of the point, and on the road to San Francisco, is *Lone Mountain*, 466 ft. high, on the top of which is a conspicuous cross. Southward of the head the sand dunes are conspicuous, and easily recognised features in approaching the entrance. The strong N.W. summer winds, drawing in over the land, raise the white sand from the 3 miles of broad beach, and carrying it inland over the hill-tops, bury grass, bushes, and scrub oak. The quantity of sand driven in from this beach is enormous, and its accumulation has greatly modified the topography of the peninsula.

A *fog bell* is (or was) kept in operation on Point Lobos, and it has been proposed to erect a lighthouse here.

Off the western face of Point Lobos lie a number of black, jagged rocks, *North Pacific*.

about 50 ft. high, but all within the 5-fathoms line, and close inshore. They are called *Seal Rocks*, being much frequented by seals, and one of them shows a large arch from particular directions. The outer one bears from Point Bonita S.E. by S. $\frac{1}{4}$ S., and is distant 2 $\frac{1}{2}$ miles. On the cliff opposite the rocks is Cliff House, a favourite resort of the people of San Francisco, 6 miles distant by road.

From the outer Seal Rock the general trend of the shore runs in a N.N.E. direction for nearly a mile, to a short, jutting, high point, off which lie Mile Rocks, and here a *lifeboat* is stationed. From this point the shore runs well to the eastward for a mile, gradually trending to the North for 1 $\frac{1}{2}$ mile to Fort Point. In the deepest part of this bend the shore is low, with small hillocks rising from the general surface and slope of the hills, and fronted by a long sand beach.

Mile Rocks.—These two rocks lie northward of Point Lobos, a short distance within the limit of the entrance of the Golden Gate. They are small, near each other, and have a height of 15 ft. above water, with a good depth of water all round and close to them; but the current twirls and eddies about them in such a manner as to render a near approach anything but agreeable or safe with a light wind. The inner and smaller rock is one-third of a mile N.W. by W. of the small jutting point inside of Point Lobos, and very nearly 2 miles S.W. $\frac{1}{4}$ S. from Fort Point. Vessels running in on the line of Fort Point and Alcatraz Island, pass less than half a mile from the outer and larger rock. The rocks bear S.E. $\frac{1}{4}$ E. from Bonita light, and distant nearly 1 $\frac{1}{2}$ mile. They were called "One Mile Rocks" by Beechey, in November, 1826.

Fort Point was formerly a bold, narrow, jutting promontory of hard serpentine rock, 107 ft. above high water, and surmounted by a small Mexican fortification, called Fort Blanco. The view from the point was one of the finest in the harbour; but the whole headland has been cut down to within a few feet of high water, and increased in area to form a large fortification. Upon the hill side rising behind it are houses for the accommodation of the garrison and workmen. Eastward of the point is a long substantial wharf, constructed for receiving stores, ordnance, &c.

Several sunken rocks lie close off the point, the two outermost, with 9 $\frac{1}{2}$ and 11 ft. over them, lying respectively 113 yards N.W. by N. and 120 yards N.E. by N. $\frac{1}{4}$ N. of the lighthouse. These rocks are especially dangerous on account of the violent eddies of the tidal current in the vicinity of the point, a close approach to which should be carefully avoided. A buoy is moored well outside them. Several large vessels have been lost on Fort Point, by venturing too close during light airs and strong irregular currents. The ebb frequently runs at the rate of 6 knots.

The Lighthouse on the N.W. bastion of the fort on Fort Point is painted white, and shows a *fixed bright* light for 1 minute, followed during the next

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minute by four consecutive *red flashes*, elevated 83 ft., and visible 15 miles. According to the survey of 1877 the lighthouse is in lat. $37^{\circ} 48' 32''$ N., long. $122^{\circ} 28' 36''$ W. The South Farallon light is visible from a vessel's deck when abreast of Fort Point.

The *fog bell* at Fort Point is on the eastern side of the lighthouse, and almost touching it. The bell weighs 1,092 pounds, and during foggy or thick weather is struck by machinery at intervals of 10 seconds.

The *Bar* off the entrance to the Bay of San Francisco, in 1874 had a least depth of $4\frac{1}{2}$ fathoms at the lowest tides. Its general form is that of a horse-shoe, commencing 4 miles southward, stretching out gradually to 6 miles abreast of Point Lobos; and when nearly up to the parallel of Point Bonita, running inshore towards that point, and forming the *Four-fathoms Bank*, from a distance of 4 miles down to 1. The average breadth of the bar within the limits of the 6-fathoms curve is about 1 mile. It falls off outside to 10 and 12 fathoms in half a mile, and deepens gradually inside. Not less than $4\frac{1}{2}$ fathoms exists over the bar, when Point Bonita light bears between N.E. by E. $\frac{1}{4}$ E. and N. by W. $\frac{1}{4}$ W.*

The fairway over the bar and the approach to the Golden Gate is marked by three *black* and *white striped* conical buoys, moored in a line about S.W. by W. from the inner part of Fort Point. The outer one is an automatic Whistle buoy, moored in $15\frac{1}{2}$ fathoms, outside the bar, nearly 8 miles S.W. $\frac{1}{4}$ W. from Bonita Point lighthouse, and 10 miles S.W. $\frac{1}{4}$ W. from Fort Point light. The middle buoy is in $9\frac{1}{2}$ fathoms, about $5\frac{1}{2}$ miles within the outer buoy, and the inner buoy is moored in 20 fathoms, about midway between Bonita and Lobos Points, and $2\frac{1}{2}$ miles from the middle buoy.

A *bell* buoy is moored in about 6 fathoms, a short distance S.E. of a $4\frac{1}{2}$ -fathoms patch on the southern part of the bar, at $3\frac{1}{2}$ miles E. $\frac{1}{4}$ S. from the Whistle buoy, with Point Bonita lighthouse bearing N.N.E.

No vessel should anchor on the bar if she can possibly avoid it; frequently a heavy swell sets in without wind, and if the current is running strong ebb, it allows little chance of escaping from an uncomfortable berth. The U.S. sloop-of-war *Vincennes* anchored on the bar in a calm, and when the flood tide made it brought up a swell, which broke over her.

The flood-tide makes on the bar about 61 minutes earlier than at San Francisco.

It has been given as a rule for steamers approaching in thick weather, to run for the bar as nearly as they can estimate, keeping the lead going until they strike 5 fathoms, and run on until the depth is increased, when the

* On June 19th, 1882, the S.S. *Escambia* capsized and sank on the bar in $5\frac{1}{2}$ fathoms, at $5\frac{1}{2}$ miles S. by W. $\frac{1}{4}$ W. from Bonita Point lighthouse. To mark the spot, until the wreck is removed, a *bell* buoy, painted in red and black stripes, is moored in 6 fathoms near the wreck, with Bonita Point lighthouse bearing N. by E. $\frac{1}{4}$ E., $5\frac{1}{2}$ miles, and Fort Point lighthouse N.E. $\frac{1}{4}$ N., $6\frac{1}{2}$ miles.

armed lead should bring up gray sand with red specks, and they may conclude themselves within the bar. Recently it has been intimated that these peculiarities of bottom exist also outside of the bar. The pilot boats cruise outside the bar.

The fog sometimes stands like a wall, outside of a line from Fort Point across the entrance, while the bay inside is beautifully clear. After the greatest heat of the day is past, this fog creeps in and envelopes land and water.

Four-fathoms Bank.—The eastern extremity of this bank is about a mile westward of Bonita Point, with a depth of 7 to 10 fathoms in the channel between, which is frequently used when the bar is impassable. The S.E. end of the bank is marked by a *black* conical buoy moored in $5\frac{1}{2}$ fathoms, nearly $1\frac{1}{4}$ mile S.W. by W. $\frac{3}{4}$ W. from Bonita Point lighthouse. At about 3 miles W.S.W. of this buoy is a similar one on the West end of the bank, but this cannot be depended on.

The shores of the Golden Gate.—On the North side of the Golden Gate the shores are very precipitous, with an occasional short stretch of sand beach at the base of the bluffs, affording a boat landing. *Point Diablo* is the first point inside Bonita, and bears N.E. by E. $\frac{3}{4}$ E., distant $1\frac{1}{2}$ mile from it; between these the shore is indented about three-quarters of a mile, affording a boat landing during smooth weather for the lighthouse people. In the vicinity of Point Diablo the faces of the cliffs show of a reddish purple colour. The red specks found on the bar are doubtless derived from the disintegration of these reddish cliffs.

From Point Diablo the shore is jagged and irregular to *Lime Point Bluff*, 495 ft. high, distant 1 mile, and bearing N.E. $\frac{3}{4}$ E. Off this point are several high rocks, but they are so close to the bluff as to be distinguishable only from certain directions. From Lime Point Bluff to Fort Point the distance is barely a mile, and the bearing S. by E. $\frac{3}{4}$ E. This is the narrowest part of the Golden Gate. Thence the bay begins to open well to the N.E.

On *Lime Point* is a *Fog Whistle*, which in thick or foggy weather sounds a blast of 10 seconds at intervals of 30 seconds. This was established in September, 1883.

On the South side, eastward from Fort Point, the shore is low, flat, and marshy, to *Point San José*, distant $2\frac{1}{2}$ miles, and bearing E. by N. This point is moderately high, with a few houses clustering upon it, and is locally known as *Black Point*. Off this reach was the "outer anchorage" of former navigators, and the Presidio of San Francisco is seen a short distance behind it.

From Point San José to *North Point*, at the base of Telegraph Hill, the distance is 1 mile, and the bearing E. $\frac{3}{4}$ N. All this space forms part of the city of San Francisco, and is covered with houses. The shore here is denominated the *North Beach*, and from about the middle of the lowest part projects a long wharf over the flats to 3 fathoms water. This has naturally caused a

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great deposit around it, and now only $4\frac{1}{2}$ ft. of water can be obtained at the N.W. part of the wharf at mean low water. There is first-rate anchorage in 9 to 12 fathoms, abreast the city, either above or below a space set apart for the traffic of the Oakland ferry-steamers, and a telegraph cable.

Telegraph Hill rises to a height of 301 ft. above the mean level of the bay, and is covered with houses to its summit wherever building room can be obtained. There was formerly a telegraph or semaphore on it.

ALCATRAZ ISLAND and Light.—This is the first island that is opened in entering the Golden Gate, and upon it is erected a lighthouse. The island is nearly 600 yards long, in a W.N.W. and E.S.E. direction, by about 260 yards in width, and rises to an elevation of 135 ft. above high water. The summit is flat, falling away gently on all sides for some distance, and then at the sides dropping perpendicularly. Deep water marks exist all round the island, and, with the exception of one or two places, the sides are so steep that a landing is effected with difficulty. Extensive fortifications are constructed upon it. At the S.E. side a small pier has been built to receive stores, ordnance, and materials. Off the N.W. part foul bottom makes out about 300 or 400 yards, and on this a conical buoy, painted in *black and red bands*, is moored about three-quarters of a cable from the island.

The lighthouse is built on the summit of the island, and bears N.W. from Telegraph Hill, distant $1\frac{3}{4}$ mile; from Fort Point N.E. $\frac{3}{4}$ E., distant $2\frac{7}{8}$ miles. The light is *fixed bright*, elevated 166 ft. above the level of the sea, and should be seen from sea at a distance of 19 miles.

The frame-work supporting the *Fog Bell* is built on the S.E. extremity of the island, close to the water's edge; the bell is struck by machinery four blows at intervals of 9 seconds, followed by a pause of 28 seconds.

In the entrance, within the line from Fort Point to Lime Point bluff, there are several hidden dangers.

Presidio Shoal, having 3 to $3\frac{1}{2}$ fathoms least water on it, lies $1\frac{1}{2}$ mile inside of Fort Point, and bears N.E. by E. $\frac{1}{4}$ E. from it. It is about 700 yards long within the 4-fathoms curve, very narrow, with sandy bottom, and has deep water all around it. Its general direction is on the above-mentioned bearing. From the shoalest part, which is near the centre, the Presidio flagstaff bears S. $\frac{1}{4}$ E., and a conical buoy, painted in *black and red bands*, is moored in about 5 fathoms, close southward of it.

During the detailed survey of the harbour, a ridge, with less than 7 fathoms on it, was found to extend in an irregular curved line from the N.W. point of Alcatraz Island to the East end of Presidio Shoal, with an average width of $3\frac{1}{2}$ cables within the 7-fathoms line. The shoalest spot yet discovered on it has only 22 ft. water over it at the lowest spring tides; this lies in the regular track of vessels, and is a danger to those of large draught. It is about 100 yards long, and lies nearly 4 cables S.E. by E. $\frac{1}{4}$ E. of Bird Rock, and $6\frac{1}{2}$ cables S.W. by W. $\frac{1}{4}$ W. from Alcatraz lighthouse. With Bonita Point

old disused lighthouse in line with the extremity of Diablo Point, W. by S. $\frac{1}{2}$ S., a vessel will pass 2 cables South of this shoal spot, and will cross the ridge in about $5\frac{1}{2}$ fathoms.

Anita Rock shows above water at low tides, and is situated $1\frac{1}{2}$ mile inside of Fort Point, and bears E. by N. from it. It is only 300 yards from the low beach, and has deep water close around it. An iron *beacon*, bearing a cage, painted in black and red bands, stands on the rock. Vessels should not approach this beacon within a cable's length, as a strong current sets across the rock. It was named after the United States quarter-master's barque *Anita*, which struck upon it.

Bird or Arch Rock is a small pyramidal rock, about 45 ft. in diameter, 18 ft. high, and bearing W. $\frac{3}{4}$ S., distant seven-eighths of a mile from the lighthouse on Alcatraz Island. When seen in the direction from or towards Presidio Shoal, it presents a perforation at low tides.

Shag Rock is a low white-topped rock, about half a mile N.N.E. from Bird Rock. From Alcatraz light it bears W. by N., distant 1 mile. For about 300 yards towards Alcatraz Island the bottom is foul and irregular, but outside that limit 10 fathoms is found. The rock shows about 4 ft. above the highest tides, being then not more than 8 or 10 ft. in extent.

Blossom Rock is a ledge which originally had 5 ft. on it at the lowest tides; in 1870 it was removed by blasting, and there is now 4 fathoms at low water over the site. A conical buoy, painted with *red* and *black bands*, is moored on its N.W. side. Vessels should not approach this buoy from any direction nearer than 2 cables, as there is a heavy tide-rip in the locality. This ledge bears E. by S. from Alcatraz light, and about 1 mile distant, being almost on the line joining the South points of Alcatraz and Yerba Buena Islands. From the summit of Telegraph Hill it bears N. $\frac{1}{4}$ W., distant 1 mile. It was discovered, and named by Captain Beechey, R.N., after his ship, in November, 1826.

YERBA BUENA ISLAND is the large high island opened to the East and South of Alcatraz, after entering the Golden Gate. The western point of this island is $1\frac{1}{2}$ mile N.E. by E. of Telegraph Hill. Its peak is 343 ft. high; the sides steep and irregular, and rising to a ridge running nearly East and West. On the western or San Francisco side the water is very deep close inshore, but from the N.W. point a 3-fathoms bank extends $1\frac{1}{2}$ mile N.W. by N., spreading to the eastward for half a mile, and thence running to the N.E. point; for about half a mile northward of the island this bank is very shallow, with as little as 1 foot of water in some places. In early times this island is said to have been densely covered with wood, and was known to navigators and whalers as Wood Island. Now it has but a few scrubby trees.

The **Lighthouse** on the S.E. point of Yerba Buena Island is a wooden tower, 22 ft. high, painted a light buff colour; it shows a *fixed bright* light, elevated 97 ft., and visible 15 miles. In foggy weather a *Whistle*, in front of

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the lighthouse, is sounded for 4 seconds, at intervals of 16 seconds; in case of a sudden fog a *Bell* is rung at intervals of 10 seconds, till the Steam Whistle is ready.

Oakland Harbour.—Opposite the city of San Francisco is *San Antonio Creek*, leading to the town of Oakland, and to the northward of this, stretching out to within two-thirds of a mile of Yerba Buena Island, is a long railway wharf or mole, with 5 fathoms water at its outer extremity. This wharf is the terminus of the Central Pacific Railway, and passengers and goods for San Francisco are ferried across in large steam-vessels. Extensive wharves are also constructed near the mouth of the creek, and this will probably be the railway terminus, should the works at the entrance form a channel deep enough for sea-going vessels.

"The work of improving this harbour is being energetically carried on by the U.S. Government. The training walls or jetties, running from each side of San Antonio Creek, are to be 9,500 ft. and 12,000 ft. long respectively, running out into deep water. Another year's work will probably complete them. There is, for a width of 300 ft. between the training walls, a channel 10 ft. deep, and for 100 ft. wide the channel is 14 ft. deep. To get the action of the tide for the purpose of keeping the channel open, a canal has to be excavated, connecting the head of the harbour with San Leandro Bay. An English vessel, drawing 16 ft., reached Oakland Wharf in 1878. At the end of the mole, $1\frac{1}{2}$ mile from the mainland, the Central Pacific Railroad Company have built a magnificent depôt or station, which was rendered necessary by the enormous local and increasing overland traffic."—*Mr. Consul Booker*, 1882.

Above San Francisco the harbour extends about 24 miles to S.E. by E., both shores being bordered by a large extent of shoal water, especially on the eastern side, between which a comparatively narrow channel runs nearly to the head.

ANGEL ISLAND.—When passing through the narrowest part of the Golden Gate, this large island bears about N.N.E., and is seen as an island for a very short time when in the narrowest part of the Golden Gate. It has an irregular and bold shore-line of about 5 miles, and an area of one square mile. It rises to a height of 771 ft., is covered with grass and bushes, and cut in every direction by deep gulleys. As seen from the south-eastward it appears part of the northern peninsula, but is divided from that on its N.W. face by *Raccoon Straits*, three-quarters of a mile in width, having a depth of water ranging from 10 to 30 fathoms, and a very strong current. A narrow, high jutting point makes out from the S.E. portion of the island, bearing N. $\frac{3}{4}$ W. from Alcatraz Island light, and distant $1\frac{1}{2}$ mile. From this head the general trend of the southern face for over a mile is W. by S. toward Saucelito Point on the mainland.

Punto de los Cavallos is half a mile N.N.W. from Lime Point Bluff. The shore-line between them falls slightly back, and a very small valley makes down

from the hills behind. From Point Cavallos the general trend of the shore is N.W. by N. for $1\frac{1}{2}$ mile to *Point Sancelito* or *Saucelito*. At a mile from Point Cavallos is the anchorage of Saucelito, where men-of-war and whalers formerly anchored. It lies abreast of the little town of *Saucelito*, whence much of the water used in San Francisco was formerly taken in steam water-boats. North of this anchorage is a large bay, with but a few feet of water. From Saucelito a railway extends about 8 miles to the town of *San Rafael*, situated up a creek leading from the head of the shallow bay of San Rafael, opposite San Pablo Point. From thence the railway branches off to the northward and westward, the latter branch extending to Duncan's Mills on the Russian River, passing by Tomales and Bodega Bays.

From Saucelito Point to the western point of Angel Island, the distance is $1\frac{1}{2}$ mile, and the bearing N.E. by E. $\frac{1}{2}$ E. To Peninsula Point, forming the south-western part of Raccoon Strait, the distance is 1 mile, and bearing N.E. $\frac{3}{4}$ E.

Off the eastern side of the harbour, opposite Angel Island, a shallow bank extends, the 3-fathoms line reaching $3\frac{1}{4}$ miles off the shore. Nearly in the centre of the upper part of the harbour, to the N.E. of Angel Island, is *Southampton Shoal*, marked by a beacon at each end, and a mile farther on some rocks extend from the eastern shore, the outermost being named *Red Rock*. The deepest and widest channel is westward of them.

At $5\frac{1}{2}$ miles N. by W. $\frac{1}{2}$ W. from the North end of Angel Island is *San Pablo Point*, on the East side of the entrance to the strait of the same name. At 2 and 3 cables W.S.W. of the point are the two small *Brother Islets*, on the eastern of which is a lighthouse. Some rocks lie to the eastward and southward, as shown on the large scale chart.

Light.—On the West end of East Brother Islet is a square light buff-coloured lighthouse, 37 ft. high, showing a *bright flashing* light every half minute, elevated 62 ft., and visible 13 miles. At 50 yards N.E. of the lighthouse is a *Fog Whistle*, which, in thick or foggy weather, will be sounded in alternate blasts of 4 seconds and 8 seconds, at intervals of 24 seconds. In case of sudden fog a *Bell* is sounded at intervals of 15 seconds, till the Whistle is ready.

San Pablo Bay, divided from the harbour of San Francisco by *San Pablo Strait*, is nearly circular, and about 10 miles in diameter, the northern half being a mud flat with only a few feet of water over it, with *Petaluma Creek* at its N.W. extremity. On the East side is the channel for large vessels, having a depth of $4\frac{1}{2}$ fathoms, leading to Karquines Strait.

Light.—On the S.E. extreme of *Mare Island*, on the North side of the entrance to Karquines Strait, a *fixed bright* light is shown, elevated 76 ft., and visible 14 miles. It is not seen when bearing eastward of E. by N. A *Bell* is sounded every 10 seconds in thick or foggy weather.

Karquines Strait runs nearly East and West for 8 miles, and is half a mile

wide in the narrowest part, with 12 to 17 fathoms water. It leads to *Suisun Bay*, which extends 11 miles to the N.E., and is 2 miles wide, the greater part being shoal.

Vallejo Bay, on the East side of *Mare Island*, is about 4 miles long, and half a mile wide, with 24 feet of water at low tide. On *Mare Island* are the government dockyards, &c. The town of *Vallejo*, with 7,000 inhabitants, is on the East side of the bay, and here there are some large warehouses for grain, where many vessels load for foreign parts. It is the southern terminus of the *California Pacific Railway*. About 3 miles eastward of *Vallejo* is *Benicia*, on the North shore of the entrance of *Karquines Strait*. It is in direct railway communication with *Sacramento*, and from it there is a service of ferry-boats to *Karquines* on the opposite shore, from whence the distance by railway, via *Oakland*, to *San Francisco* is 32 miles.

SACRAMENTO RIVER rises near the base of *Mount Shasta*, about 300 miles northward of *San Francisco Harbour*, and flows through a wide alluvial valley, receiving the waters of several tributaries. On the East side of *Suisun Bay* are the islands forming the delta of the river; they cover an area of about 25 square miles, and are entirely overgrown with *Tula* (rushes). The channels between these islands are narrow; the true channel lies through the southern branch, and has depth enough for vessels not drawing over 11 ft.

At 11 miles above *Suisun Bay* is the entrance of the channel leading to *Joaquin River*; the channel is navigable for 10 miles to the river's mouth, but the river itself can only be used by boats. Above this *Sacramento River* gradually bears away to the northward, with several considerable bends, and at low water is navigable as far as the city of *Sacramento*, 50 miles above *Suisun Bay*; here it is half a mile wide, and the tide rises 2 or 3 ft.

Sacramento, with a population of about 22,000, is situated on the East side of the river, and to the southward of its junction with *American River*. The *Railway Company* has some large works here. The distance to *San Francisco* by water is about 120 miles. In 1882 the canneries of *Sacramento River* packed 180,000 cases of salmon, each case containing 48 tins of 1 lb. each.

TIDES.—As a general rule, there are upon the *Pacific Coast* of the United States one large and one small tide during each day. The heights of two successive high waters—occurring one, a.m., and the other p.m. of the same twenty-four hours—and the intervals from the next preceding transit of the moon are very different, so much so that at certain periods a rock which has $3\frac{1}{4}$ ft. upon it at low tide may be awash on the succeeding low water.

These inequalities depend upon the moon's declination. They disappear near the time of the moon's declination being nothing, and are greatest about the time of its being greatest. The inequalities for low water are not the same as for high, though they disappear and have the greatest value at nearly the same times.

North Pacific.

When the moon's declination is North, the higher of the two high tides of the twenty-four hours occurs at San Francisco about eleven and a half hours after the moon's transit; and when the declination is South, the lower of the two high tides occurs at about that interval. The lower of the two low waters of the day is the same which follows next the higher high water.

The corrected establishment, or mean interval between the moon's transit and the time of high water at San Francisco, is $12^h 6^m$. The mean rise and fall of tides is 3.6 ft.; of spring tides, $4\frac{1}{2}$ ft.; and of neap tides, $2\frac{3}{4}$ ft. The mean duration of the flood is $6^h 39^m$; of the ebb, $5^h 51^m$; and of the stand, 34^m . The average difference between the corrected establishment of the a.m. and p.m. tides of the same day is $1^h 28^m$ for high water, and $0^h 38^m$ for low water. The differences when the moon's declination is greatest are $2^h 30^m$ and $0^h 48^m$. The average difference in height of these two tides is 1.1 foot for the high waters, and 2.2 feet for the low waters. When the moon's declination is greatest those differences are 1.5 foot and 3.7 ft. respectively. The average difference of the higher high and lower low waters of the same day is 5.2 ft., and when the moon's declination is greatest, 6.1 ft. The higher high tide in the twenty-four hours occurs about $11^h 22^m$ after the moon's upper transit (southing), when the moon's declination is North, and about $1^h 2^m$ before, when South. The lower of the low waters, about 7^h after the higher high tide. The greatest observed difference between the two low waters of one day was 5.3 ft., and the greatest difference between the higher high and lower low waters of one day was 8.5 ft.

SAILING DIRECTIONS.

For approaching and entering San Francisco Bay.—In approaching the coast every opportunity should be seized for determining the vessel's position, as fogs and thick weather prevail near the land. Vessels coming from the southward make the coast about Point Año Nuevo (lat. $37^\circ 7' N.$), and follow it at a distance of 4 or 5 miles up to the bar. Steamers keep close under the land for fear of losing it in foggy weather. Coming from the westward, they first sight the South Farallon Island (lat. $37^\circ 42' N.$), with its lighthouse, and keep upon either side of it; but it is preferable to go to the southward, especially in thick weather and at night, as the vicinity of the island has not been surveyed in detail. From the South Farallon lighthouse the Point Bonita light bears N.E. by E. $23\frac{3}{4}$ miles. Coming from the north-westward vessels make Punta de los Reyes, 597 ft. high, in lat. $38^\circ 0' N.$, long. $123^\circ 0' W.$, with its lighthouse, and pass within 2 or 3 miles of it, 15 fathoms being found within a quarter of a mile of it, but vessels are apt to lose the wind by getting too close under it. From the western extremity of this point, Point Bonita light bears E. $\frac{1}{4}$ S., distant $25\frac{3}{4}$ miles, the line passing over the tail of Duxbury Reef, at a

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distance of $17\frac{1}{2}$ miles from Point Reyes. There are usually two pilot-boats cruising off the bar.

The prolongation of the range from the North end of Alcatraz Island to Fort Point, giving a course N.E. $\frac{1}{4}$ E. for vessels entering the Golden Gate, is designated by Sir Edward Belcher "the fair-way line;" and he calls the island and fort the "fairway marks." Three fairway buoys, previously described, are moored nearly on the line of Fort Point and Alcatraz Island lighthouses in line; the lighthouses in line, bearing N.E. by E., lead over the bar in $5\frac{1}{2}$ fathoms least water. In clear weather, and with a favourable wind, a vessel can cross the bar in not less than $4\frac{1}{2}$ fathoms from the line of the North end of Alcatraz Island just open of Point Bonita, N.E. by E. $\frac{1}{4}$ E., round to the shore South of Point Lobos, N. by W. $\frac{1}{4}$ W. Northward of the former line the Four-fathoms Bank, having $3\frac{1}{2}$ fathoms upon it, commences 1 mile West of Bonita, and stretches out over 3 miles, with a breadth of 1 mile. Upon this bank the clipper *Golden Fleeco* struck in 1857, and came into port with 7 or 8 ft. of water in her hold. She was the second of that name that was unfortunate in entering the harbour, the first having been totally lost on Fort Point.

The deepest water over the bar is with Alcatraz Island open a little more than its width from Fort Point, N.E. by E. $\frac{1}{4}$ E.; on this line the bar is very narrow, and the least depth is $5\frac{1}{2}$ fathoms at lowest tides.

Between the eastern extremity of Four-fathoms Bank and the shore, the distance is seven-eighths of a mile, and within this space can be found the deepest water for entering the harbour, but it would be dangerous for a sailing vessel to attempt it with a flood tide and light winds. While it is breaking on the bank, only a heavy swell is found through this $8\frac{1}{2}$ -fathoms channel, and small sail boats have passed in safety when they dared not try the bar. Close in under the cliffs, 2 or 3 miles above Bonita, there is anchorage in 8 fathoms, muddy bottom.

The following remarks on the northern channel are taken from Lieutenant S. Eardley-Wilmot's book "Our Journal in the Pacific."—Appendix, pp. vi, xi—xii:—

"We entered the harbour of San Francisco by the northern or Bonita Channel. This has been mentioned before as preferable to crossing the bar for steamers of deep draught, and further experience leads me to repeat that opinion for the following reasons:—

1. On coming from the northward at night, or in foggy weather, Point Reyes is easily made, and the land kept in sight all the way to Bonita Point, taking care to give Duxbury Reef a wide berth. After rounding Point Reyes, should the weather be too thick to keep sight of the coast, it would be advisable to anchor in Drake's Bay, and weigh the moment the fog lifts. H.M.S. *Zealous* (drawing 26 ft.) did this on one occasion, and entered the harbour when she could not have attempted the Bar Channel.

2. When leaving or entering the harbour during, or shortly after, heavy weather, this channel is preferable as carrying the smoothest and deepest water. The least water is 7 fathoms, just off Bonita Point, whereas on the Bar there is only $5\frac{1}{2}$ fathoms, which is not sufficient when there is much sea running.

3. When leaving the harbour during foggy weather, Bonita Channel is certainly more secure.

The turning between Bonita Point and Four-fathoms Bank is rather sharp, and for that reason it is advisable when going *out* that way to start with the last of the flood, so as to pass Bonita Point before the ebb makes with any strength, on account of the strong eddies off Bonita Point.

We moored in about the same spot as on our previous visit, which I consider the most convenient anchorage for men-of-war; Mission Rock bearing S. 16° E., Rincon Rock buoy, N. 50° W., and Telegraph Hill, N. 61° W. Care must be taken not to anchor within 500 yards of the shore, as some order exists against men-of-war anchoring within that distance."

Vessels can also cross the southern part of the bar in about $5\frac{1}{2}$ fathoms, by steering with Round Top and Lone Mountain in line N.E. until Bonita Point bears between North and N. by W. $\frac{1}{2}$ W., when it can be steered for.

During clear, moderate weather, any vessel can cross the bar, within the limits we have mentioned, without running until she has got on the "fairway line," whereby she might lose her slant of wind. Should the wind fail, or be light, and the current adverse, anchor outside the bar in 15 fathoms, mud and fine sand; or after crossing the bar in 6 to 10 fathoms, fine gray sand, with red specks in some places. Run in mid-channel between the heads, and avoid too close proximity to the northern shore, not only in entering, but in leaving; the high, bold bluffs causing calms and baffling airs, even with a south-easter blowing out.

Between Fort Point and the opposite shore, take special care not to approach Fort Point too close, because the currents set round it irregularly and with great rapidity, and the bottom is uneven and rocky. A depth of 69 fathoms is given in the centre of the channel. In the *Golden Gate* an ebb current has been measured running about 6 miles per hour. As a general rule the winds increase within the heads, drawing in very strongly abreast of Fort Point. When off this point steer for Alcatraz lighthouse until the North point of Telegraph Hill bears E. by S.; then steer to give it a berth of a quarter of a mile, running through among the shipping.

In making the port at night, it is customary to run for the Whistle buoy and cross the bar with Fort Point light on with Alcatraz Island light; or better, the latter a little open to the northward. But this practice frequently involves much delay and annoyance, when the wind will not permit a vessel to attain this position without a tack. With Bonita light bearing from N. by W. to N.E. by E., a vessel may boldly run on within those limits. and unless there

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be a heavy swell safely cross the Four-fathoms Bank. Give Bonita a berth of a mile, and when within the heads and Bonita abeam, gradually open Alcatraz light North of Fort Point, until abeam of the latter; then run for Alcatraz, until the lights of the shipping show the vessel's position. Hauling up for them, anchor off the North beach in 10 fathoms, or off the N.E. front of the city in 10 fathoms, soft mud.

In coming upon the coast in thick foggy weather, sailing vessels should not run into less than 50 fathoms, because the water around the South Farallon, and off Point San Pedro and Punta de los Reyes, is very bold. Cordell Bank, however, with 25 fathoms least water, exists at about 20 miles to the westward of the last. S.W. of the line passing through the Farallones and Noenday Rock, the 100-fathoms curve is only 4 miles distant, and the 50-fathoms curve only 2 miles, with a very irregular bottom. If the Farallones be made, a course can be easily laid for the bar, but it would be unadvisable to run into less than 10 fathoms, soft mud, if the Whistle buoy be not heard, as the set and strength of the currents off the bay are yet undetermined. Sir Edward Belcher says, that being caught in a fog, he anchored in 15 fathoms to the southward of the bar, and determined "that southerly of the fairway line the ebb set N.N.E., flood S.S.W." We suppose he means from the N.N.E. and the S.S.W. During the season of freshets in the Sacramento and tributaries, the discoloured water outside the bar will frequently point out the position of the entrance.

Steamers in thick weather were accustomed to run close along the coast, and endeavoured to make the land North of Point San Pedro, running in until they got about 15 fathoms, and then laying a course for the bar, shoaling upon it to about 5 fathoms, and then gradually deepening, while the fog-gun (now replaced by a Siren) gave the direction of Bonita light.

In beating out, vessels start on the last quarter of the flood, make the first tack to the northward of Blossom Rock, and weather it on the second; thence they keep between Alcatraz and the South shore, avoiding Bird Rock, 1 mile West of the South end of the island, and giving a good berth to Fort Point, past which the ebb current will carry them rapidly (with a strong tendency towards the South shore), and a couple more tacks will carry them clear of the heads. If the vessel be bound to the northward, and the weather set in thick, with the wind to the N.W., she makes a tack off shore to the southward of the Farallones; if the weather be clear, short tacks are made off shore until she works off to Los Reyes, because the sea to the leeward of that headland is much smoother, and the current less; then stands off until a course can be made for her port.

The Winds.—Some remarks upon the Winds of the Coast of California have been previously given on pp. 206-7. At San Francisco ice is rarely seen, and the thermometer never remains at freezing point 24 hours. Snow has not been seen, except a few flakes, with two exceptions, for 25 years. The difference in

temperature between day and night is seldom greater than 15° F., while the extreme range between the highest and lowest observations on record is but 53°.*

DUXBURY POINT and Reef.—From Point Bonita to Duxbury Point, forming the West side of Ballenas Bay, the course is W. by N. $\frac{1}{4}$ N., and the distance 9 $\frac{1}{2}$ miles. The point, sometimes called *Ballenas*, is a table-land about 100 ft. high, which stretches along the coast for a mile or more, and gradually rises to a narrow, nearly treeless ridge, 1,389 ft. high at its greatest elevation, and running in a straight line 25 $\frac{1}{2}$ miles N.W. $\frac{1}{4}$ W. to Tomales Point. The old Californians expressively call it the Cuchilla Grande. Parallel to this ridge on the East, and starting from the West end of the great cross ridge of Table Mountain, runs another to the north-westward, and the depression between them, abreast of Duxbury Point, forms Ballenas Bay, as it does Tomales Bay farther up the coast. This depression forms a long narrow valley, well watered and timbered, and in many places cultivated. Two streams running into each bay have their sources nearer the bay from which each runs.

Duxbury Reef makes out 1 $\frac{1}{2}$ mile S.E. $\frac{1}{4}$ S. from the southern extremity of the point, and stretching towards Point Bonita forms a safe anchorage in northerly weather. From the tail of the reef to the rocky point E.N.E. from it, the distance is 3 miles, and from this line to the greatest bend of the bay the distance is 1 $\frac{1}{2}$ mile. A *buoy*, painted in *red* and *black bands*, has been moored in about 6 fathoms, close off the extremity of the reef.

BALLENAS BAY.—In this bay the 3-fathoms line makes off three-quarters of a mile from the S.E. face of Duxbury Point, but approaches the low sand beach East of the narrow entrance to the lagoon. From 4 to 8 fathoms of water, with a regular bottom of sand and mud, is found in the bay, and 6 fathoms quite close to the reef. A *lifeboat* is stationed here. From Duxbury Point to the bluff at the entrance to the lagoon, the distance is 1 $\frac{1}{2}$ mile N.E. by N.

The lagoon North of the bay is at the foot of the mountains, and, except small crooked channels, is bare at low tides, and filled with small islets. The South side of this lagoon is bounded by a long, narrow, sand-spit, stretching so nearly across it as to leave an entrance of but 100 yards wide at the S.W. part. Only a few small vessels run between Ballenas or Bolinas and San Francisco. The bay is a safe anchorage in summer, and the lagoon is readily accessible for small craft, except in heavy weather.

* "The West; from the Census of 1880;" by R. P. Porter, published at Chicago, 1882, p. 497. Much information concerning the Western States will be found in this valuable work.

The shore North of Bonita Point is bold and high, presenting a marked and peculiar undulating surface at right angles to the sea front.

North of Duxbury Point the hard rocky shore continues bold and high, but gradually merges into cliffs, consisting chiefly of yellowish clay and sand resting upon granite; and as the surface is regularly undulating, with the direction of the alternate ridges and valleys at right angles to the shore, the wearing action of the surf forms a continuous series of round-topped, bright, vertical bluffs, averaging 100 ft. high, and presenting a very noticeable feature from the sea. Its resemblance to portions of the coast of England was one of the reasons which induced Drake to apply the name New Albion to the country in June, 1579.

The mountains in the background rise over 2,000 ft., and the "Table Mountain," of Beechey, attaining an elevation of 2,604 ft., stretches nearly 2 miles inland at right angles to the coast, and forms a prominent mark from seaward, and from the Bay of San Francisco. A few large trees are seen along the top of the main ridge, running parallel with the coast and behind the valley connecting Ballenas and Tomales Bays. The ridge is very sharp, and appears flat-topped only in two directions.

SIR FRANCIS DRAKE'S BAY.—From the tail of Duxbury Reef to the West end of Point Reyes, the course is W. $\frac{3}{4}$ N., and the distance $17\frac{1}{2}$ miles. To the East end the course is W. by N., and the distance $14\frac{1}{2}$ miles. From Duxbury the shore is bold and compact, running nearly N.W. by W. for about 10 miles, then curving regularly to the westward, changing to a low shore, until it reaches its greatest latitude at the Estero de Limantour, which bears N. by E. $\frac{1}{2}$ E. from the East end of Point Reyes, distant 3 miles; thence the line curves to the southward and S.W., 1 mile West of the point, leaving a long, high, narrow point stretching to the East, and off which the breakers extend half a mile. This curving shore-line forms Drake or Sir Francis Drake's Bay, which affords a large and admirable anchorage in heavy N.W. weather; and by anchoring close in under the North side of the point in 4 or 5 fathoms, hard bottom, good but contracted anchorage is obtained in S.E. gales, as the swell rolling in from the S.W. is broken by the reef.

Several esteros or lagoons open into the North side of the bay, but their entrances are very narrow and shoal. The largest is the *Estero de Limantour*, which stretches to the northward over 3 miles, and one of its numerous arms approaches within a mile of the ocean beach, 5 miles North of Point Reyes Head. The entrance to this lagoon has 8 ft. water, and is generally marked by breakers on either hand. Coasters can enter with the prevailing N.W. wind. It was named after Limantour, notorious for his attempted land-claim fraud in California. He was a Frenchman, but a citizen of Mexico, and asserted that in trading upon this coast in 1841, he lost the Mexican vessel *Ayachuco*, at the entrance to this estero.

POINT REYES is the most prominent and remarkable headland North of Point Concepcion. It is distinctly visible from the entrance to San Francisco Bay, and the summit of the ridge presents an irregular jagged outline, with the highest part about one-fourth of its length from the western extremity. Its southern face is a precipitous wall of hard sienitic granite, rising boldly from the ocean, attaining an elevation of 597 ft. in 300 yards, and stretching away nearly in a straight line E. by N. and W. by S. for 3 miles. This direction is peculiar on the coast, and would not be expected from a consideration of the trend of the coast mountains, and of the Farallones, which are in line N.W. and S.E. On the North side the cape falls away regularly to a low undulating neck of land, cut up by esteros making in from Drake Bay. When made from the southward it is raised as a long, high island, but on approaching it from the westward it is projected upon the mountains running North from Table Mountain, and its characteristics are not so easily recognised. Its base is very broken and rocky, and bordered by crags and hundreds of rocks, but they may be boldly approached, and 8 fathoms, hard bottom, obtained within less than a quarter of a mile. Off the eastern extremity a reef makes out half a mile in continuation of the point. Upon this reef it breaks heavily in bad southerly weather, but 9 fathoms can be had close to the breakers. Off the western head a depth of 12 fathoms is found quite near to the rocks.*

The Lighthouse on Point Reyes, a white tower, 23 ft. high, is situated on the steep slope of the bluff point, about 200 yards from its extremity. It shows a *bright flashing* light every 5 seconds, elevated 296 ft., and visible 24 miles. In thick and foggy weather a *Fog Siren* will sound blasts of 5 seconds at intervals of 70 seconds. Lat. $37^{\circ} 59' 36''$ N., long. $123^{\circ} 1' 21''$ W. A *lifeboat* is stationed here.

Vessels bound to San Francisco from the northward always make Point Reyes, and, when up to it, sight two mountains on the southern peninsula of San Francisco as islands. One of these is *Blue Mountain*, 1,100 ft. high, the other *Abbey Hill*, 1,250 ft.

Cordell Bank.—A shoal had long been known to exist some miles westward of Point Reyes, and Mr. Davidson made a cast of 30 fathoms in that vicinity as early as 1853. It is now reported that "the least water found was 25 fathoms, about 1 mile S.E. $\frac{1}{2}$ E. from the central point of the shoal (about 20 miles W. by S. $\frac{1}{2}$ S. from Point Reyes). Within the curve of 30 fathoms, the shoal is 5 miles long, with an average width of $1\frac{1}{2}$ mile; but it is 12 miles long, and 5 miles wide within the 50-fathoms curve. Its longest axis is in a direction N.W. and S.E., or nearly on the prolongation of a line through the Farallon Islands." Sounding within the 30-fathoms curve, the lead failed to

* The headland of Punta de los Reyes was discovered by Cabrillo in 1542, but the present name was given by Viscaïno, in 1603.

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bringing up specimens of bottom, it proving to be rocky; the armed lead brought up live barnacles. Outside of this curve there is a deposit of white shells, broken fine. Beyond the depth of 40 fathoms, coarse black sand, mixed with gravel and broken shells, was found. The general set of the current appeared to be in a southerly direction, with a velocity of about 1 to $1\frac{1}{2}$ knot per hour. The water gradually deepens from the shoal toward the mainland, attaining a depth of 70 fathoms, after which it shoals again toward the shore. It is probable that depths of less than 25 fathoms may yet be found within the limits of this shoal, it will therefore receive further attention, because of its importance to vessels coming from the northward in thick weather. A change of swell is rapidly perceived upon the shoal.—*Mercantile Marine Magazine*, July, 1873, p. 204.

THE FARALLONES.

SOUTH FARALLON.—The southern and principal one of the six rocky islets, known as the *Farallones de los Frailes*, lies off the Golden Gate at a distance of $23\frac{1}{2}$ miles; the whole group is disposed in a nearly straight line, running N.W. from the southern one. This is the largest and highest, extending nearly a mile East and West, attaining an elevation of about 340 ft. above the sea, and presenting to the eye a mass of broken jagged rocks, upon which no vegetation exists, except a few stunted weeds. The rocks are sharp angular masses, which, becoming detached by the operation of natural causes, roll down upon the more level parts of the island, and cover it with irregular boulders. Notwithstanding that it is the outcrop of an immense dyke of granite, the condition of the superficial portion is such that it could be separated into small fragments by a pick or crowbar. A more desolate and barren place can hardly be imagined. From the hills about the Golden Gate the South Farallon is plainly visible, rising in regular pyramidal form.*

These islets are resorted to by immense numbers of sea-birds, the eggs of which are taken and sent to San Francisco. Sea-lions frequent their rocky shores.

Vessels from the westward, running for the Golden Gate, should keep to the southward of the South Farallon, especially in thick weather and at night. To the westward of it a depth of 50 fathoms is obtained at a distance of 3 miles,

* The Farallones de los Frailes were discovered by Ferrello, in February, 1543, and he is stated to have seen six islands in this vicinity, one large, and five very small, which Cabrillo had passed on the previous voyage. He states that for five days it was impossible to effect a landing upon them, on account of the S.W. winds and heavy sea.

Sir Francis Drake is the first that specially mentions them, in 1579, as lying off the harbour or bay, where he refitted his ships.

shoaling to 20 fathoms in 2 miles; whereas inside of it the bottom is very regular at 30 fathoms for 10 miles, and then decreases regularly to the bar. On the S.E. side of the island there is said to be good holding-ground in 15 fathoms. The San Francisco pilot-boats cruise off the island.

South Farallon Light.—The tower stands on the highest peak of the principal island, and is built of brick, 29 ft. in height, surmounted by a lantern and illuminating apparatus of the first order of Fresnel. It is a *revolving bright* light, showing a prolonged flash of 10 seconds every minute, elevated 360 ft. above the mean level of the sea, and visible 26 miles. Lat. $37^{\circ} 41' 49''$ N., long. $123^{\circ} 0' 4''$ W. Point Bonita lighthouse bears from it N.E. by E., distant $23\frac{1}{2}$ miles, and Point Reyes lighthouse N. by W. $\frac{3}{4}$ W., $17\frac{1}{2}$ miles.

At 200 yards S.E. by S. $\frac{1}{4}$ S. from the keeper's dwelling is a *Fog Stren*, which, in thick or foggy weather, will give blasts of 5 seconds at intervals of 45 seconds.*

About half a mile S.E. $\frac{1}{2}$ E. of the lighthouse is a rock of $6\frac{1}{2}$ fathoms, on which the sea breaks in heavy weather. The pilots also report having seen breakers on a rock between the South and Middle Farallones, and supposed to have only 3 or 4 fathoms over it. Breakers have also been observed in heavy weather on a $5\frac{1}{2}$ -fathoms rock, lying $2\frac{1}{2}$ miles W. by N. $\frac{3}{4}$ N. from the lighthouse, and about half a mile S.W. by S. $\frac{3}{4}$ S. from the Middle Farallon.

The **MIDDLE FARALLON** is a single rock, between 50 and 60 yards in diameter, and rising 20 or 30 ft. above the water. It lies N.W. by W., distant $2\frac{1}{2}$ miles from the lighthouse on the South Farallon. Its geographical position is lat. $37^{\circ} 43' 31.6''$ N., long. $123^{\circ} 1' 54.9''$ W.

The **NORTH FARALLONES** lie nearly in a line with each other and the Middle and South Farallones, and consist of a group of four islets, having a pyramidal appearance as their name denotes, and comprised within a space of little more than half a mile square. The northern three are quite high and bold, the highest peak of the middle one attaining an elevation of 166 ft., whilst the southern one of the group is a mere rock of about 35 yards in diameter, and hardly 20 ft. above water. Viewed from the S.W. or N.E., breakers extend across from the largest island to the next one S.E., and during a heavy ground swell it has been seen, from Point Reyes Hill, breaking on an isolated sunken rock, lying apparently between the northern and largest islet. From certain directions a small pyramidal detached peak shows close to the North side of the northern islet. The northern islet, 160 yards in extent, bears

* In January, 1859, a Fog Whistle, of 6 inches in diameter, was placed on the South side of the eastern part of the island, about 275 ft. from the water. It was erected over a natural hole, in the roof of a subterranean passage connected with and open to the ocean, and was blown by the rush of air through the passage, caused by the sea breaking into its mouth. It is said to have been heard at the distance of 7 or 8 miles. It was probably removed in 1880, when the Siren was established.

* It was from the S. in the track fully southerly exists, it Shoal off

N.W. by W. $\frac{1}{2}$ W., distant $6\frac{1}{2}$ miles from the lighthouse on the South Farallon, and from Point Reyes lighthouse it bears South, distant 14 miles.

At 2 miles to the south-eastward of the North Farallones, it is stated that a sunken rock exists, having 4 fathoms water upon it, with kelp around it, except when torn away by storms. In good weather the fishermen fish around it; but in bad weather the sea breaks upon it.

Noon-Day Rock lies W. by N., distant a little over 3 miles from the North Farallon, with intervening rocky bottom in 35 fathoms, and $9\frac{1}{2}$ miles W. by N. $\frac{1}{2}$ N. from the South Farallon lighthouse. Between it and Point Reyes the depth increases to 50 fathoms about midway. This danger lies nearly on the prolongation of the line from the South Farallon, through the North Farallon. It is of very limited extent, having from 20 to 30 fathoms immediately around it. When examined in 1874, for the purpose of blasting, two pinnacles were found, one of them having only 14 ft. over it at mean low water. It is plainly visible when directly over it. In very heavy weather and low water the sea breaks upon it, but this indication seldom exists, and must not be depended upon for ascertaining its position. A buoy is moored on them. It is recommended that large vessels should not pass between them and the North Farallones, as an irregular ridge may connect them.

Point Reyes light should here be plainly visible. Bonita light will not be visible from a ship's deck, but may be seen from aloft under very favourable atmospheric circumstances.

In the description of the South Farallon, and in the directions for approaching San Francisco, we have heretofore advised vessels approaching the Golden Gate at night and in thick weather to keep to the southward of the South Farallon light. This advice has now more significance, and should be followed. With Punta de los Reyes and the Farallones in sight, vessels bound in and running between them should keep the western head of Point Reyes open on a N.N.E. course, coming nothing to the eastward, until the North and South Farallones are in range, then bear away for the Golden Gate. In that position the rock will bear S.E., distant $2\frac{1}{2}$ miles. Coming from the north-westward at night, vessels should not bring the South Farallon light to bear anything East of S.E. by E., which will clear the rock by 2 miles, and the North Farallones by 1 mile.

South-west of the line passing through the Farallones and Noon-day Rock, the 100-fathoms curve is only 4 miles distant, and the 50-fathoms curve only 2 miles, with very irregular bottom.*

* It was reported, January, 1863, that a shoal had been discovered about 80 miles S.W. from the S.E. Farallon. It is said to have but from 5 to 7 fathoms of water on it, directly in the track of vessels bound into San Francisco. This reported danger has been carefully sought for by the U.S. surveyors, who could find no indication of shoal water, and, if it exists, it must, in the opinion of Mr. George Davidson, consist of sharp peaks.

Shoal off the California Coast.—In lat. $37^{\circ} 25' N.$, long. $137^{\circ} 30' W.$, Reed Rocks are re-

POINT TOMALES.—Northward of Punta de los Reyes is a long reach of broad white sand beach, backed by sand dunes, and extending in a N. $\frac{1}{2}$ E. direction about 12 miles, curving to the N.W., and changing to a high precipitous coast, running to Point Tomales, which bears N. by W., 15 miles from Point Reyes. Three-quarters of a mile before reaching the point a rocky islet, 80 ft. in height, is seen close inshore. At 8 miles above Point Reyes is the opening to an estero, the North point of which is low and sandy. The wider arm runs 1 mile towards the head of the western branch of the Estero de Limantour, and little more than that distance from it; the other arm runs nearly $1\frac{1}{2}$ mile to the north-westward. The ridge forming Tomales Point and the western shore of Tomales Bay is the northern extremity of that starting from Duxbury Point. About $4\frac{1}{2}$ miles from the point the ridge is 673 ft. high, with slightly lower ground a few miles South. It is where the sand dunes strike this ridge that the coast changes its character; thence to the point it is bold and rocky, with breakers about one-third of a mile off the point, and on the prolongation of the ridge, which averages less than three-quarters of a mile in breadth for the last 4 miles.

THE BAY OF TOMALES extends from Tomales Point S.E. $\frac{1}{2}$ E. for 12 $\frac{1}{2}$ miles, with an average width of seven-eighths of a mile. The entrance is narrow, and obstructed by a bar having a depth of 10 ft., between sandy humps of 7 ft. The bar lies nearly half a mile East of the extreme point, and 400 yards from the bluffs. It is exposed to the full force of the N.W. swell, and with the least swell from seaward it breaks across the whole entrance. For 2 or 3 miles this bay is contracted, but has a narrow deep channel close under the western shore. At 4 miles within the point lies a small island near the middle of the bay; beyond it the depth of water becomes more regular. The shores are thickly settled with people engaged in agricultural pursuits.

The railway from Saucelito to Russian River skirts the eastern side of the bay, and at the village of *Tomales*, a few miles inland from the entrance, are some large warehouses for storing grain.

BODEGA HEAD, 18 miles N.N.W. from Point Reyes, forms the northern point of Bodega Bay, considering Tomales Point the southern. The head is 200 or 300 ft. high, with a slightly rounding summit, and continues of nearly the same height for a mile or two northward, where it changes to a broad sand beach, with low country near, but high hills in the background. The face of the land about here begins to change from its uniform want of trees, to hills partially covered. It has been frequently held out as a warning not to mistake Bodega Head for Punta de los Reyes, but there exists no reasonable ground for raising a question on this subject, although navigators who have lost or

ported, having but from 3 to 5 fathoms water upon them. This information was obtained in 1865, and since then several U.S. surveying vessels have unsuccessfully searched for it; but further examination is necessary. They are referred to more fully hereafter.

jeopardised vessels offer, as an excuse, the great similarity of the coast and headlands to those near the Golden Gate. The surveyors were never able to detect it. The highest part of the head is about 265 ft. above the ocean. From an examination of this section, it is believed that it is the continuation of the Tomales ridge.

BODEGA BAY.—From Tomales Point to Bodega Head the course is N.W. $\frac{1}{2}$ W., and the distance $4\frac{1}{2}$ miles. The average width of the bay to the eastward of the above line is $1\frac{1}{2}$ mile, with the shore running nearly a parallel course. It is bordered by numerous rocks, is abrupt, and reaches a height of 594 ft. less than a mile inland. The anchorage lies between the head and the mouth of the *Estero Americano* (called *Aratcha* by the Russians), which lies E. by N. $\frac{1}{2}$ N., $2\frac{1}{2}$ miles from the head. One mile West of the estero a low narrow sand spit $1\frac{1}{2}$ mile long, and covered with bushes, stretches towards the head, within 100 yards of it, where a passage exists for the waters of the extensive lagoon North of the sand-spit, having small and intricate channels, but almost destitute of water at low tides. The anchorage is half a mile outside of this passage, and about N. $\frac{1}{2}$ E. of the rocky islet, in 5 or 6 fathoms, hard bottom of coarse sand and small patches of clay. It is protected by the head and the low rocky islet and reef, about three-quarters of a mile off the S.E. face, from the full force of the N.W. swell, which generally rolls in disagreeably in the open part of the bay, if the weather is heavy. The reef is densely covered with kelp, and the breakers usually indicate its position. Between the islet and the head there is a narrow $4\frac{1}{2}$ -fathoms passage, opening directly upon the anchorage. In coming from the N.W. in summer this channel is available, but in beating out it is too contracted to be safe. During the winter season it is necessary to anchor well out, to be ready to slip and run, as the sea-room is very contracted and the swell heavy. Some vessels have ridden out heavy south-easters, but several have been lost. In beating out, the only danger is the reef off the head.

On account of the general depression of the coast-hills behind Bodega Bay to about 500 or 600 ft. elevation, and the valley in which the *Estero Americano* lies being perpendicular to the coast line, the summer winds draw in towards the Petaluma valley with great force. The trunks of the oak trees rise straight for about 10 ft., then bend almost at right angles, without a branch for 10 or 15 ft., and terminate in a clump of branches all dragged out by the force of the wind. Fogs are found drawing in sooner and more frequently than upon any other part of the coast.

The country in the vicinity of the bay is very productive, both in the valleys and upon the hills. The produce is placed in lighters at the "Port" or embarcadero, about 1 mile within the lagoon, and carried by the current to the anchorage. It is high water, on full and change, at 11^h 17^m; springs rise $4\frac{1}{2}$ ft., neaps $2\frac{1}{2}$ feet.

A fine tract of agricultural country stretches behind the coast-hills, extend.

ing from Russian River valley to Petaluma Creek, by which channel much of the produce of this region finds its way to San Francisco.

The shore between Bodega Head and Fort Ross, about 15 miles to N.W. $\frac{1}{2}$ W., curves slightly to the eastward of the line joining the two places. Sand dunes commence $1\frac{1}{2}$ mile from the southern point of the head, and extend $2\frac{1}{2}$ miles to the mouth of a small stream called *Salmon Creek*; these dunes are bordered by a broad sand beach.

Russian River.—At $9\frac{1}{2}$ miles N.W. by N. $\frac{1}{2}$ N. from Bodega Head the *Slavianska* or *Russian River* empties into the sea, breaking through the coast-hills, which here reach an elevation of 2,200 ft. De Mofras calls it the *San Sebastian*. During the summer months a dry bar forms completely across the mouth of the river, so that the road along the coast passes over it. It requires heavy rains to break through it, and forms again after a few weeks of dry weather. During the summer the bed is dry above *Healdsburg*, 30 miles from the mouth, and can be forded in several places in that distance. Before breaking through the coast-hills it comes from the northward, through a broad fertile valley. The arroyos and streams opening into the river near the coast are filled with a very dense growth of heavy redwood; and in 1860 a tram-road was being graded along the coast to the lagoon inside of Bodega Head, to carry the lumber from the mill on the river.

At *Duncan's Mills*, 6 miles up Russian River, are some extensive saw-mills, in the midst of great forests of redwoods. This is the present terminus of the railway from Saucelito, the distance from San Francisco being 80 miles. There is a good road down to the sea, and stage communication as far northward as Mendocino City, 96 miles distant. Above Duncan's Mills, several miles farther up the river, is *Gurneyville*, with large saw-mills, situated at the end of a branch from the San Francisco and North Pacific Railway.

From Ross Mountain, 2,198 ft. in height, the discoloured water of the river has frequently been seen working along close inshore to the northward, and never to the South. The fishermen experience the same eddy current.

Northward of this river again commence the high coast-hills, covered with timber, which gradually approaches the coast, and reaches it about halfway to Fort Ross. The Russian vessels used this as a distinctive mark for making that anchorage. Where the timber commences to skirt the coast a bold spur of the mountains comes directly upon the sea. At Fort Ross there is a small extent of open, cultivated ground, moderately low, but backed by the high wooded country. The coast and coast-hills to the northward are mostly covered with dense forests of immense redwood, pine, and a thick undergrowth. At one of the Coast Survey mountain stations over forty trees were cut down which measured $5\frac{1}{2}$ ft. in diameter (spruce) to $8\frac{1}{2}$ ft. (redwood).

Fort Ross.—The rocky, contracted, and unsafe anchorage off this place is 32 miles N.W. $\frac{3}{4}$ N. from Point Reyes, and 15 miles from Bodega Head. The large white buildings on the rising ground, and about 100 ft. above the sea,

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are the only marks for making it, and the shore is so steep and guarded by rocks and reefs as to render approach dangerous. Lumber, grain, and dairy products are shipped here.*

Two miles above Fort Ross is a small contracted anchorage, called *Timber Cove*, where a great deal of timber is sawn, and carried by coasters to San Francisco. Eight miles above Ross is another contracted anchorage under *Salt Point*, where coasters load lumber.

In 1879 Commander Coffin, U.S.S. *Hassler*, reported that a dangerous patch of foul ground lies off the entrance of Timber Cove. It lies from one-half to three-quarters of a mile off shore, with several rocky heads, one nearly awash at low water. Kelp extended out from the shore and covered the western half of the patch, which, being small, is not often marked by breakers. Vessels passing should not shoal their water to less than 30 fathoms in this vicinity.

From Fort Ross to Punta de Arena the coast is almost straight, running N.W. by W. $\frac{1}{4}$ W. for 37 miles. It is compact and abrupt the whole distance, covered with trees to the water's edge, and backed by an unbroken ridge of hills about 2,000 ft. high, and wooded to their summits.

Haven Anchorage, about 24 miles north-westward along the coast from Fort Ross, is a contracted anchorage, under high precipitous rocky islets, with a short stretch of beach on the main, affording a boat landing. There is a protection, when anchored close in, against heavy N.W. weather; but it would be very difficult to recognise the locality unless the position of a vessel approaching it were accurately determined. Northward of this anchorage high, bold rocks line the coast for 4 or 5 miles. They are generally known as *Fishing Rocks*.

A few miles South of this anchorage is the mouth of the *Walalla River*, open in the rainy season, but having a dry bar in summer. It rises South of Fort Ross, behind the first range of coast-hills. One of the Coast Survey stations on the North side of the river, and 3 or 4 miles from the coast, has an elevation of 2,192 ft., and this may be taken as the general height of this coast range.

* The property of the Russian establishment at Ross and Bodega had (August, 1841) just been transferred to Capt. Suter, of New Helvetia, at San Francisco, for the consideration of 30,000 dollars. In the purchase was included all the stock, houses, arms, utensils, and cattle belonging to the establishment. The buildings at the two posts numbered from fifty to sixty, and they frequently contained a population of 400 or 500 souls.

Bodega was first established by the Russians in 1812, under a permission of the then Governor of Monterey to erect a few small huts for salting their beef. A small number of men were left to superintend this business, which in a few years increased until the place became of such importance in the eyes of the Spanish authorities, that on the Russians attempting to establish themselves at San Francisco (on the Island of Yerba Buena), they were ordered to leave the country. This they refused to do, and, having become too strong to be removed by the Spanish force, they had been suffered to remain undisturbed until the time of our visit.—*Commodore Wilkes, U.S.N., Narrative, &c.*, vol. v. pp. 179-80.

POINT ARENA is the first prominent headland North of Point Reyes, from which it bears N.W. $\frac{1}{4}$ W., distant 67 miles. Approached either from the northward or southward, it presents a long level plateau, stretching out about 2 miles West of the highlands, and terminating in a perpendicular bluff, which averages about 200 ft. in height, except the extreme N.W. part, which is comparatively low, partially covered with sand, and destitute of trees for some distance inland. When seen from the southward, with the sun shining upon the face of the bluff, it shows remarkably white for the length of 2 miles; in fact, no point upon the coast presents such a bright appearance, or such uniform vertical bluffs, composed of hard rocks, twisted and distorted into many plications. Bold water is found close off the point, outside the kelp, which, stretching strongly to the southward, shows the set and comparative strength of the current, running at 1 to 2 knots per hour along the coast.

The Lighthouse, at about 100 yards from the N.W. extremity of Point Arena, is a white tower, 100 ft. high, showing a *fixed bright* light, elevated 156 ft., and visible 19 miles. At 121 yards West of the lighthouse is a steam *Fog Whistle* which, in thick or foggy weather, is sounded for 5 seconds at intervals of 25 seconds. Lat. $38^{\circ} 57' 10''$ N., long. $123^{\circ} 44' 42''$ W.

About 2 miles southward of the point, a small contracted valley opens upon the shore, and off it is an anchorage for small vessels, moderately well protected from the N.W. swell, but open to the S.W. Several schooners have gone ashore here. A large bed of kelp lies off the anchorage.

About $1\frac{1}{2}$ mile N. by W. from the point are several rocks showing just above water, and upon which the least swell breaks. These were noticed by Vancouver in October, 1793. When 1 mile off Arena a high, sharp, pinnacle rock shows well out from the shore on the horizon to the southward, with some rocky islets inside, and breakers well out beyond the *Pinnacle Rock*, yet northward of it; but their distances from shore are probably not so much as a mile. At 10 miles North of Point Arena is a small stream called the *Nevarro*, upon which is a lumber mill. Articles floating from this river are found on the coast to the northward of it.

Albion River.—From Point Arena, the first point to the north-westward is 24 miles distant, and bearing N.W. by N. $\frac{3}{4}$ N. After passing Arena the coast trends to the eastward of North, and for 6 miles presents a low shoreline with sand beach, changing suddenly to a straight, high, bluff shore, with a few trees, and backed within half a mile by hills of 2,000 ft., covered to their summits with wood. At $16\frac{1}{2}$ miles from Arena is the mouth of *Albion River*, a very small stream, with the barest apology for a harbour at its mouth. A saw-mill upon this stream induces coasters to obtain freights here, but a great many of those trading have been lost. In 1853, the coast surveying steamer *Active* passed in, but broke her anchor on the rocky bottom.

MENDOCINO BAY.—At $20\frac{1}{2}$ miles from Arena, and 4 miles northward of Albion River, is a contracted indentation called Mendocino Bay, available for

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a few vessels in summer, but dangerous in winter. The northern and southern points are about three-quarters of a mile apart, and the eastern shore retreats nearly half a mile. At the southern head are several small rocks, and one large islet surrounded by rocks, off which are heavy breakers. Midway between the heads is a small reef, with $3\frac{1}{2}$ fathoms least water, upon which the sea breaks heavily with very little swell; deep water is found close around this reef. Off the northern head is very bold water close to it. Into the N.E. part of the bay enters the *Big River* or *Rio Grande*, between 200 and 300 yards wide, with a good channel on the southern side, a broad flat sand on the northern, and a bar at the mouth with but a few feet of water, and upon which the sea always breaks. The eastern shore is bold and rocky. In the south-eastern part is a sand beach, with a reef extending from its centre.

The bay forms so slight an indentation in the coast-line, that it is difficult to find, without acquaintance with its minutest peculiarities, as there are no prominent marks by which to determine it. The North head is a table bluff about 60 ft. high, and destitute of trees to the northward and some distance inshore. The South bluff is likewise destitute of trees, but more irregular in outline than the other. Vessels bound for this bay in summer work a little to windward; then run boldly in towards the North point, to the eastward of which the houses become recognised, keep as close as possible along the shore, gradually decreasing the distance to not less than 100 yards just off the South end of the point in 6 fathoms, run on about 150 yards past the point, head up handsomely, and anchor in 5 or 6 fathoms, hard bottom. It is a bad berth in summer, and in winter a vessel must anchor far enough out to be able to slip her cable and go to sea upon the first appearance of a south-easter. Several vessels have been driven ashore here.

Mendocino City is situated on the North side of the bay, and about half a mile above it, on the North side of the river, is an extensive saw-mill, which was formerly placed on the North head, the timber being brought to it on a tramway. The town is sometimes called *Meigsville*.

From the point just North of Mendocino Bay (the first one made from Arena), the shore runs nearly straight for 28 miles N. by W. $\frac{1}{2}$ W., being low and bounded by rocks for 12 miles, when the black hills reach the water, and present an almost vertical front 2,000 ft. in height. At about 16 miles northward of Mendocino Bay is the mouth of *Ten-Mile River*, the bar of which becomes dry at the end of the dry season.

From the deepest part of the bight, which is northward of Ten-Mile River, the general trend of the coast to Cape Mendocino is N.W. $\frac{3}{4}$ W., 45 miles, and for the whole of this distance it is particularly bold and forbidding, the range of hills running parallel to the shore and rising directly from it. It has been

found impossible to travel along this stretch of seaboard; and the trail runs well into the interior valleys.

Shelter Cove.—From the compact shore above described a plateau, destitute of wood, and from 60 to 300 ft. in height, juts out, just above latitude 40° N., for a distance of half a mile, affording an anchorage from N.W. winds, and may perhaps be regarded as a harbour of refuge for small coasters which have experienced heavy weather off Cape Mendocino, and are short of wood and water, both of which may be obtained here from one or two gulches opening on the sea. From Point Arena it bears N.W. by N. $\frac{1}{2}$ N., distant 65 miles.

The whole sea-face of the bluff or plateau is bounded by thousands of rocks above and below water, and vessels coming from the North for shelter must give it a wide berth, rounding it within one-third of a mile, and anchoring in 5 fathoms, hard bottom, about one-third of a mile from shore. In this position fresh water comes down a ravine bearing about North, and an Indian village existed in 1853 at the bottom of the wooded ravine, a little further to the eastward. There is always a swell here, and boat landing may not be very easy.

Punta Gorda is 17 miles N.W. by W. $\frac{1}{2}$ W. from Shelter Cove, and, as its name implies, is a large, bold, rounding point. Half a mile off it lies a large rocky islet, with rocks close inshore, North of the point. From Punta de Arena it bears N.W. $\frac{3}{4}$ N., distant 81 miles, and the line passing tangent to Punta Gorda runs 1 mile outside of Cape Mendocino. La Perouse calls Cape Fortunas Punta Gorda. Between Shelter Cove and Cape Mendocino several sunken rocks extend nearly a mile off the coast; on some of them the sea only breaks occasionally, and they can rarely be detected when strong winds are blowing. Vessels should not approach this coast within less than $1\frac{1}{2}$ mile.

CAPE MENDOCINO is 93 miles N.W. $\frac{3}{4}$ N. from Punta de Arena, and $12\frac{1}{2}$ miles N.W. by N. $\frac{1}{2}$ N. from Punta Gorda. Here the range of coast-hills from the southward appears to meet a range coming from the eastward, forming a mountainous headland about 3,000 ft. high, which is the western limit of the N.W. trend of this section of the coast.

The **LIGHTHOUSE**, on the West extreme of Cape Mendocino, is an iron polygonal tower painted white, and 20 ft. high, surmounted by a red dome to the lantern. It shows a lens light of the first order, *revolving* in every half minute, showing a *bright flash* of 15 seconds duration, followed by an eclipse of 15 seconds. It is elevated 423 ft. above the sea, and may be seen 27 miles. Lat. $40^{\circ} 26' 21''$ N., long. $124^{\circ} 24' 14''$ W.

In 1873 the U.S. surveyors examined the dangers off Cape Mendocino, and they are now accurately placed on the chart; they break only at low water, with a very large swell on. In 1875 another sunken rock, with 6 ft. over it, was found at $1\frac{1}{2}$ mile S.W. $\frac{3}{4}$ W. from the lighthouse. The dangers lying off this cape are characteristic of several points on the coasts of California and Oregon, and, until thorough surveys are made, vessels should not attempt a

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passage inside of outlying rocks, and should also give them a good berth in passing outside.

Blunt Rocks.—About 3 miles off the cape, lies a reef, just under water, known as Blunt Rocks or Reef, upon which the sea generally breaks. This reef, the outermost known danger off the cape, was noticed by Vancouver as being about 1 league off shore. The southern rock on it bears W. $\frac{3}{4}$ S. nearly 3 miles from the lighthouse. Between this reef and the cape are numerous sunken rocks, rendering the passage between very dangerous. A reef has also been reported at about 8 miles N.W. by W. from the rocks off Cape Mendocino, but this is supposed to be the same as Blunt Reef, the distance probably having been over-estimated.

To the southward, and immediately off the pitch of the cape, lie numerous rocks and rocky islets, the latter being large and high, with a peculiar pyramidal or sugar-loaf appearance. None of them seem to be more than half a mile from the shore, which is almost perpendicular, and destitute of a beach. The isolated rock lying just off the pitch of the cape, and one-third of a mile W. by S. $\frac{3}{4}$ S. from the lighthouse, is known as the *Sugar-loaf* or *Haystack*, and is 328 ft. high. The face of the cape is very steep, rocky, and worn. Above this the general appearance of the land is rolling, and the surface covered with timber. The pyramidal islets off it are very readily distinguished in approaching from the North or South.

At 7 miles South of Mendocino is a small stream, called *Mattole*. Upon the sides of the hills in Lower Mattole, and not above a mile from the Pacific, coal-oil springs were discovered in 1861. Along the course of this stream are numerous bottom lands under cultivation. A few miles above its mouth is the village of *Petrolia*.

"The United States Government has in contemplation the construction of a harbour of refuge on the northern coast, but there is a difference of opinion between the engineers and the naval officers as to which of the present harbours is capable of being made the most desirable for the purpose. The selection is limited to the open roadstead between Cape Mendocino and the Columbia River. Trinidad, Crescent City, Moell's (? Mack's) Arch, Port Orford, Cape Gregory, and Cape Foulweather, have each been surveyed, and Trinidad or Port Orford will probably be the final selection."—*Mr. Consul Booker*, 1881.

From Cape Mendocino to Cape Orford the hills upon the seaboard range from 2,000 to 3,000 ft. high, running parallel with the coast at a distance of from 3 to 5 miles, receding somewhat at the Eel River Valley and Point St. George, and at other points coming abruptly to the ocean. The whole face of the country is covered with dense forests, and offers almost insuperable obstacles to the opening of roads intended to strike the trail leading along the valleys of the Sacramento and Willamette, through which railways are now being constructed.

CAPE FORTUNAS, or False Mendocino, lies northward of Cape Mendocino, distant 5 or 6 miles, and is another bold spur of mountainous headland, similar, and almost as high as that cape. Between the two the shore recedes slightly, is depressed, and forms a beach, receiving a small stream called *Bear* or *McDonald Creek*, coming down through a narrow valley or gulch, and closed by a bar near the end of the dry season.

Off Cape Fortunat lie several rocky islets, presenting the same peculiarities as those off Mendocino, and a rock, with 12 ft. water over it, lies 6 cables W. $\frac{1}{4}$ S. from the Cape Rock. There is no beach at the base of the almost perpendicular sea-face. We have ventured to call this Cape Fortunat, to avoid the repetition of Mendocino, and to commemorate Ferrel's (the pilot, and successor of Cabrillo) discoveries.

It is reported that soundings have been obtained well to the westward of the cape; should such prove correct, the fact will be of importance to vessels, especially steamers, bound North or South, when near the coast and enveloped in fog, as it would enable them to judge of their position, and change their course.

Eel River.—After passing Cape Fortunat the shore changes to a straight, low, sandy beach, with valleys running some distance inland. Eel River is a small stream, with a bar at its mouth, and distant 14 miles from Cape Mendocino. It is very contracted and crooked, receiving the waters of a great many sloughs near its mouth, and draining a most fertile valley, which is rapidly filling with settlers. Salmon is plentiful here; in 1882 the canneries packed 336,000 tins of 1 lb. each. The bar had 9 ft. water over it at high tide, in the spring of 1850.

HUMBOLDT BAY.—The entrance to this bay, also called *Qual-a-waloo*, lies 21 miles from Sugar-loaf Islet, off Cape Mendocino; and the bar N. by E., $22\frac{1}{2}$ miles from Blunt Rocks. The bar is $1\frac{1}{4}$ mile from the entrance between the sand points, or 2 miles from the S.W. and highest point of *Red Bluff*, which is the second bluff above Eel River. Like all the bar rivers on this coast it undergoes irregular changes, depending much upon the prevalence, direction, and strength of the wind. Thus, early in 1851 it bore N.W., distant 2 miles from Red Bluff, and about half a mile from the North Spit, with $3\frac{1}{2}$ fathoms upon it. In the fall of 1852 the bar was reported to have moved to the northward its entire width, and the ranges for going in, as laid down by the survey of the previous year, were entirely useless. In 1857 less than 13 ft. at high tide could be found upon it, and its extent was very much increased. Eventually a deep and narrow channel will be cut through.

According to the survey of 1858 the channel over the bar, between the breakers on either side, varied from less than a cable in width, between the North and South spits, to about 2 cables at a mile outside, where the depth was from $3\frac{1}{4}$ to 4 fathoms, deepening to 8 and 11 fathoms farther in. Vessels

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should not attempt to enter without a pilot or the aid of the tug. It is high water, on full and change, at 12^h 2^m; springs rise 5½ ft., neaps 4½ feet.

About 1852 a steam-tug was placed upon the bay, and has rendered the most effective service in determining the changes of the bar. When vessels are seen approaching the bar, a flag is hoisted on Red Bluff, and the tug goes out to take them in. If it is breaking so heavily on the bar that she cannot get through it, and it is yet practicable for the vessel to run in, she takes up a position and hoists her flag as a signal for the vessel to steer for her. She is invaluable for towing out the deeply laden lumber vessels, as the summer winds blow directly in the channel. A *lifeboat* is stationed here.

An automatic *Whistle buoy*, painted in *black and white stripes*, is moored in 15 fathoms, nearly 2 miles E. ¼ N. from the lighthouse, and with Red Bluff bearing S.E. by E. ¾ E. This probably replaces the bell-boat formerly moored near this position.

The **LIGHTHOUSE** is erected on the North Spit, three-quarters of a mile North of the entrance, and about midway between the bay and sea shores. It consists of a keeper's dwelling, with a tower rising 21 ft. above the roof, from the centre, both being whitewashed, and surmounted by an iron lantern painted red. The light is a *fixed bright* light of the fourth order, elevated 53 ft. above high water, and visible 13 miles. In thick or foggy weather a steam *Fog Whistle*, about 100 yards S.E. of the lighthouse, is sounded in alternate blasts of 4 and 8 seconds, at intervals of 24 seconds.

It is suggested that a better position for the lighthouse would be on Red Bluff, where the light would not be so likely to be obscured by the mist hanging over the surf on the beach.

The bay is situated immediately behind the low sand-spits and dunes, and extends 9 miles North, and 4 miles South of the entrance, being contracted to less than half a mile in width between the South Spit and Red Bluff; it then expands to nearly 3 miles, and runs 1½ mile to the eastward of Table Bluff. The single channel running into this part of the bay divides into two crooked ones, which contain from 1 to 3 fathoms of water; all the rest shows a bare mud flat at low tides. Abreast of the entrance it is nearly a mile in width, with extensive sands bare at low tides, lying midway between the opposite shores, and running nearly parallel with them. To the northward its average width is half a mile for a distance of 3½ miles. It then expands into a large shallow sheet of water, having two or three crooked channels through it, but the greater part being bare at low tides, showing extensive mud flats, bordered by a grassy flat nearly a mile in width. In the channel way close to the North Spit, not less than 3 fathoms may be carried, increasing for 3 miles to 6½ fathoms.

The *North Spit* averages half a mile in width, and its southern extremity is composed of sand dunes and grassy hillocks, disposed in a marked manner parallel with the direction of the N.W. winds. Two miles from the entrance

trees cover the hillocks, and run northward 1 mile, when a space of a mile occurs within them. After that they continue along the shore.

The *South Spit*, from the entrance to Table Bluff, does not average one-quarter of a mile in width, is formed of low sand dunes and grassy hillocks, and bordered on the bay side by marsh. At the southern extremity rises *Table Bluff*, which the name well describes, to a height of about 200 ft., its western point nearly reaching the sea beach, and forming a good landmark for making the bay. At 5 miles East of it the hills commence rising. Abreast of the North end of the South Spit rises *Red Bluff*, presenting to the entrance a perpendicular face, composed of sand and gravel, coloured by the decomposition of iron ore near its surface, which is 96 ft. above high water, and destitute of tree or bush. The bay front of the bluff is about one-third of a mile long, gradually declining to the low, flat land to the North, and also falling away to the South and East. On this bluff the pilots have a flagstaff to range with known points of trees beyond, by which they cross the bar, and keep the run of its changes.

The military station of *Fort Humboldt* is on a reservation on Red Bluff, about 100 ft. high, immediately behind the town, which is on the West side of the bluff. The low land on the eastern shore, above Red Bluff, averages half a mile in width, and runs as far as Eureka, gradually changing to marsh, and bounded by plateaux and hills covered with wood. At a mile North of the entrance, and on the eastern side, enters a small stream, called *Mowitch* or *Elk River*; three-quarters of a mile above this is situated the town of *Bucksport*, off the northern part of which a depth of 3½ fathoms is found within 150 yards of the shore. Vessels are gone ashore the Saw-mill Wharf here at high tide to load; at low tides they rest upon the muddy bottom.

The town of *Eureka* is 4 miles N.N.E. of the entrance, and off it is a portion of the channel, having nearly 3 fathoms in it, but no channel reaching it having more than 1½ fathom. The town, which now has a population of about 2,000, was laid out before this latter fact was discovered. Vessels lie at the wharves, resting on the mud at low tide; there is regular communication with San Francisco by steamer, and large quantities of redwood lumber are exported.

Abreast of Eureka lie several low marshy islands cut up by sloughs and ponds. The largest, called *Indian Island*, is about a mile long N.E. and S.W., by half a mile in width. It is marked by two hillocks, surmounted by clumps of trees, near which, in 1854, there were several wretched Indian huts. The smaller islands lie between this and the eastern shore, and parallel with it.

Arcata, formerly Uniontown, is situated on the N.E. shore of the bay, and can only be reached by boats at high tide. It is the starting point for the Trinity and Klamath gold mines. From it an extensive wharf stretches far out over the mud flat, which vessels can reach at high tides.

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Mad River runs into the sea about a mile North of Humboldt Bay. It averages about 100 yards in width, with a bar at its entrance which prevents egress; but the vast amount of timber in the valley must eventually find a passage through a canal to the N.W. point of Humboldt Bay. A deep slough from the latter is said to approach quite close to Mad River, thus favouring the execution of such a project. This river is the Rio de los Tortolos of Heceta and Bodega, 1775.

TRINIDAD HEAD lies N. $\frac{1}{2}$ W., $17\frac{1}{2}$ miles from the bar of Humboldt Bay, and North 39 miles from Cape Mendocino. The low sand beach off Humboldt continues past Mad River to within a couple of miles of Trinidad Bay, when it changes to a bluff, guarded by innumerable rocks. For the entire distance of the low beach a depth of from 10 to 15 fathoms may be found 1 mile from the shore.

The **Lighthouse** on the southern shore of Trinidad Head is a white tower, 18 ft. high, showing a *fixed bright* light, varied by a *red flash* every minute, elevated 198 ft., and visible 17 miles. Lat. $41^{\circ} 3' 4''$ N., long. $124^{\circ} 8' 56''$ W.

TRINIDAD BAY.—The bay or roadstead of Trinidad, or *Sho-ran*, is very contracted, but having deep water, and all dangers visible, it forms a moderately good summer anchorage. Trinidad Head, forming the western shore of the roadstead, and a prominent mark when seen from close in, is about 375 ft. high, covered with a low, thick undergrowth of scrub bushes, has very steep sides, and 8 fathoms close to its southern base. Off the western face, for nearly half a mile out, lie several high rocky islets, with numerous sunken rocks between. At half a mile South of the head is *Pilot Rock*, 101 ft. high, having 9 fathoms close to it. From the South face eastward to the 3-fathoms curve, the distance is 1 mile, and the depth of the bight to the northward of this line is about half a mile, with half a dozen rocks lying outside the 3-fathoms line, but well above water. In the northern part of the bay there is a sand beach, extending about half a mile; thence eastward the shore is very rocky, the bluff being about 300 ft. high, and covered with a heavy growth of timber. The town, or village, fronts the N.W. part of the roadstead, and the boat landing is on the North side of a round knoll, making out about 100 yards from the low neck running to Trinidad Head. A wharf is now built here, at which vessels lie to load lumber. A very considerable quantity of seaweed lies off the shore.

In working into the anchorage, beat in boldly past the outermost rock, until the rock just off the eastern side of Trinidad Head is in range with the knoll (having a few trees upon it), between the town and the head, with the South face of the head bearing W. by N., and anchor in 7 fathoms, hard bottom, within one-third of a mile of the rock and head, having the neck visible to the westward of the knoll, and a sugar-loaf rock beyond the neck showing over it. A swell will generally be found setting in. In winter it is a dangerous anchorage, and if a vessel is unluckily caught, her chances of riding out a south-

easter are very few. The town during the winter is said to be nearly deserted, but a brisk trade is carried on in summer. The connection with San Francisco by steamer is yet uncertain. It has been proposed to construct a harbour of refuge here.

The land in this vicinity is very rich, and well adapted to agriculture. The redwood trees grow around it, and attain an enormous size. The stump of one which was measured was about 20 ft. in diameter, and a dozen trees standing in the vicinity averaged over 10 ft. One was affirmed to be standing on the bank of a small stream at the S.E. part of the bay, measuring over 90 feet in circumference. The bark of these trees has a thickness of from 8 to 14 inches; they grow perfectly straight, retaining their thickness to a great height, begin to branch at 50 or 100 ft., and frequently attain 250 ft. in height. The forests of this timber, when free from undergrowth, present an imposing sight.*

The shore running N.W. by N. from Trinidad Head for 5 miles is remarkably broken and rocky, which induced Vancouver to call its northern extremity, in lat. $41^{\circ} 8' N.$, *Rocky Point*. About 1 mile off this point lie several rocks, sometimes known as the *Turtles*. About $1\frac{1}{2}$ mile southward of them is *Cone Rock*, a mile off the shore.

From Rocky Point the shore takes a gentle sweep eastward, making its greatest indentation at the North end of the once famous *Gold Bluff*, in lat. $41^{\circ} 27' N.$, long. $124^{\circ} 4' W.$, and then trending westward to Crescent City. Gold Bluff has an extent of 10 miles, and is very bold and high.

Between Rocky Point and Gilon Bluff, which is the first one to the northward, there is a stretch of low sand beach, immediately behind which is an extensive lagoon several miles in length, and from a quarter to 1 mile in width. It lies parallel with the beach, and at some seasons is not connected with the ocean, but at others an opening exists at the northern extremity. The Indian name of this lagoon is *A-shaw-sho-ran*.

Redding Rock lies nearly 5 miles off the South end of Gold Bluff, in lat. $41^{\circ} 21' N.$, long. $124^{\circ} 11' W.$ It is a single, large, rocky islet, about 100 ft. high, and reported to have deep water all around it, with no outlying dangers. Vancouver places it in lat. $41^{\circ} 25'$ on his chart, and 4 miles off shore; but in the narrative states the distance at half a league, and that it is half a mile in circuit. His track lies inside of it. It is stated that a reef, commencing at the shore 2 miles above the rock, stretches out towards it. The rock received its present name in 1849 or 1850.

KLAMATH RIVER.—The mouth of this river is in lat. $41^{\circ} 33' N.$, long. $124^{\circ} 5' W.$ It is perhaps 200 yards wide, having a long sand-spit on the

* Port Trinidad was discovered June 10th, 1775, by Heceta and Bodega, and placed in lat. $41^{\circ} 7' N.$ Near it they place a stream, which they call the Rio de los Tortolos, or Pigeon River; this is now called Mad River.

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South side, running N.W. and parallel to the high hills which form the North shore. South of the entrance for $1\frac{1}{2}$ mile are outlying rocks, and at the North side of the entrance lie several others. It is reported to have $2\frac{1}{2}$ fathoms upon the bar. Upon passing it in 1853, within less than a mile, the sea was breaking across it, and no appearance of a safe channel was presented. Small schooners enter it; but it is stated that the mouth was completely closed in the winters of 1851 and 1860, and that the bar changes with every change of heavy weather.

At 3 or 4 miles northward of the Klamath is a small sharp indentation at the mouth of a gulch, off which lie one large and several small rocks; but from a distance of $1\frac{1}{2}$ mile it could not be determined whether any stream opened here. It has, however, received the name of *False Klamath*, because it has misled small coasters seeking for the Klamath, although there is no sand point on either side, as exists at the latter. The State map of California has a creek, called Ahmen, opening here. The coast thence continues bold for several miles, when the hills begin to recede, and the shores present many pleasant slopes, unencumbered with forests, and now under cultivation. The shore is low, and regularly sweeps to the westward for a couple of miles, forming the roadstead of Crescent City.

Off the coast between Klamath River and Crescent City are several outlying rocks. About 6 miles northward of the river are *Sisters Rocks*, above water, and half a mile off shore. A dangerous rock, with 3 ft. water over it and deep water around, lies 4 miles S.E. by S. from the Sisters, and 1 mile off the point near Wilson Creek; there is no kelp on it, and the sea rarely breaks.

CRESCENT CITY BAY.—This, the most dangerous of the roadsteads usually resorted to on the coast, has acquired some importance, on account of the town (Crescent City) being the depôt for the supplies of miners working the gold diggings on the Klamath, Trinity, and Salmon Rivers. It is filled with sunken rocks and reefs, and has a goodly number showing above water. No vessel should think of gaining an anchorage here without a pilot, or perfect knowledge of the hidden dangers. The dangerous patches are nearly all marked by kelp.

The outer danger, having $3\frac{1}{2}$ fathoms water over it, is known as *Chase Ledge*, and is several hundred yards in extent, with 12 to 14 fathoms around it; it lies nearly a mile S.E. by S. $\frac{1}{2}$ S. from Round Rock, 8 cables S. by W. $\frac{1}{2}$ W. from Mussel Rock, and $1\frac{1}{2}$ mile off shore, being considered highly dangerous, as it lies in the track of shipping to or from the southward, and is not well marked by kelp. Other sunken rocks lie half a mile S. by E. of the lighthouse islet.

The usual anchorage is on a line between the lighthouse and the North side of *Whaler Island*, the large islet lying 8 cables East of it, in $3\frac{1}{2}$ fathoms, hard bottom. To reach this position, run for the small *Round Rock*, lying

North Pacific.

S.E. $\frac{3}{4}$ E., seven-eighths of a mile from the lighthouse, and 42 ft. high; pass it on the East side, giving it a berth of 100 yards; steer N. by W. $\frac{1}{4}$ W. for three-eighths of a mile, passing 100 yards East of *Fauntleroy Rock*, which is covered at three-quarters flood, and on which an iron *beacon*, 25 ft. high, has been erected. If this rock be covered, and the beacon gone, its position is generally marked by a breaker. It is necessary to keep it close aboard, because there is a sharp bayonet rock, having only 2 ft. of water on it, and 200 yards to the eastward. Head up for the town, and anchor in $3\frac{1}{2}$ fathoms, with Flat Rock in line with Battery Point. In summer there is always some swell here, but in winter it rolls fearfully, and vessels must choose a position to be ready to run to sea at the approach of a south-easter.

To enter or leave it at night, as is done by the mail and coasting steamers, requires a perfect local knowledge of the dangers and peculiarities of the landmarks. Coasting steamers, in fine weather, usually anchor close inshore to discharge freight, which is received in lighters.

A wharf has been built out from Battery Point, and landing is now easily effected in good weather. In south-easters the breakers wash over it. Communication is maintained with San Francisco and other ports by mail and coasting steamers, which, at one time, carried as many passengers and as much freight for this place as they carried to the Columbia River.

The town lies N.W. from the anchorage, immediately on the low shore; old drift logs, in some instances, forming the foundation for wooden houses. The population amounts to about 500. The lands adjacent are being cultivated; a grist mill has been built, and a good trail leads to the "diggings" on the Klamath and Illinois Rivers.

Battery Point, the S.W. point of the bay, is elevated about 25 ft., and continues so to the westward. The lighthouse is erected on the rocky islet about 300 yards S.S.W. of the point, and connected with it at low tides by a broken mass of rocks, over which a single foot-bridge is constructed.

The **LIGHTHOUSE** consists of a keeper's dwelling, of stone, the natural color (gray), with a low tower of brick, plastered and whitewashed, rising from the centre, and surmounted by an iron lantern painted red. It is situated at the S.W. part of the roadstead, on the seaward extremity of the island point, which is here about 45 ft. above high water. The light is *fixed bright*, varied by a *flash* every $1\frac{1}{2}$ minute, elevated 80 ft. above high water, and visible 15 miles. It illuminates 315° of the horizon, and is in lat. $41^\circ 44' 34''$ N., long. $124^\circ 12' 22''$ W., $79\frac{1}{2}$ miles N. by W. from Cape Mendocino.

It is high water at Crescent City, on full and change, at $11^h 44^m$; springs rise $5\frac{1}{2}$ ft.

POINT ST. GEORGE, $2\frac{1}{2}$ miles W. by N. from Crescent City light, is from 50 to 150 ft. high, with table-land some distance back. It is bounded by hundreds of rocks, some of which rise perpendicularly 200 ft. from the water. Three or four of the largest present a remarkably white appearance, which

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serves to distinguish this point. The extensive reef in its vicinity may have led to confusion among the old discoverers by their confounding it with Cape Orford. The present name was given to it by Vancouver, in 1792. It has been proposed to establish a *lighthouse* here.

Crescent City Rocks.—This name is applied to the rocks and reefs extending W. by N. $\frac{1}{2}$ N. from the South part of Point St. George for a distance of 7 miles. The name of *Dragon Rocks* was given to them by Vancouver, but the former is the name now generally used. A passage exists inside of the reefs, and is invariably used by the mail and coasting steamers, when entering or leaving Crescent City Bay. There are ten or twelve outlying rocks, and many sunken ones, with the passage running between them and those close to the shore. This passage is about a mile in width, has 10 fathoms in it, and the general course through is nearly N.W. and S.E., but not straight. Among the multitude of rocks on the land side of the passage are three very large and prominent ones, about 200 ft. high. It has already been stated that several of the rocky islets have a well marked white appearance, occasioned in part by the deposits of sea birds.

The position of all the visible rocks and breaks of this reef have been determined, but it is thought that a detailed survey would reveal others. The N.W. rock, called *N.W. Seal Rock*, is 45 feet high, and lies about $6\frac{1}{2}$ miles W. by N. $\frac{1}{2}$ N. from Point St. George, and between the two lies *St. George Reef*, which breaks, and another group of rocks, on the southern extremity of which is *Star Rock*, 64 ft. high, on the West side of the entrance to the channel. In 1859, *Shubrick Reef* was reported to lie 8 miles S.W. by W. $\frac{1}{2}$ W. from the point, but its existence is doubtful.

Pelican Bay.—From the northern part of Point St. George the coast runs straight for 12 miles N. $\frac{1}{2}$ W., thence W.N.W. for 9 miles, forming a deep indentation, called by La Pérouse, in 1787, Pelican Bay, and by Vancouver, St. George's Bay. For 13 miles from Point St. George the shore is low for some distance back, and fringed by a sand beach, to the mouth of a small stream called *Smith River*, on which are some salmon canneries. The entrance to this river was looked for in vain from the deck of the steamer, although scarcely 2 miles off shore, but they were able to form a good estimate as to where it should open by the peculiarities of the northern bank, which is a low perpendicular bluff, in about lat. $41^{\circ} 57'$ N., long. $124^{\circ} 13'$ W. To the westward of the entrance of Smith River, and about $1\frac{1}{2}$ mile from the coast, is *Hussler Rock*, a sunken rock with only 12 ft. water over it, sometimes marked by a little kelp.

Half-way between Crescent City and the mouth of Smith River there is a small sheet of water, called *Lake Earl* or *Tulawa*. North of this small stream the coast requires an elevation of about 100 or 200 ft. for a short distance inland, and is bounded by high mountains.

Mount Shasta is a magnificent peak, 14,442 ft. high, in the rear of the

entrance to Smith River, its position being about lat. $41^{\circ} 20'$ N. long. $121^{\circ} 45'$ W. Its summit, on which there is a hot spring, gives evidence of its having been an active volcano. The snow lies in patches on the sides and part of the peak of this mountain.

The 42° parallel is the boundary between the States of California and Oregon, at 14 miles northward of Point St. George. It strikes the coast near a noticeable high pyramidal mound, rising abruptly from the plateau, which is destitute of timber.



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CHAPTER V.

THE COAST OF OREGON AND WASHINGTON TERRITORY,
FROM CHET-KO RIVER TO ADMIRALTY INLET.

THE State of Oregon forms an integral portion of the United States of America, the sovereignty having been acknowledged by the treaty of July 15th, 1846, between that power and Great Britain, and is that country described in the present chapter, lying between the parallel of 42° N. and the Columbia River, the former separating it from the State of California, described in the preceding pages.

The actual right of possession of Oregon territory was the theme of long and angry discussion, and notwithstanding the cession of the claim by Britain to its present owners, it must ever be acknowledged that their right by the usual laws of sovereignty was indefensible.

The N.W. coast of America, in this part, was first made known to Europe by Sir Francis Drake, in his voyage in 1578, before mentioned. He reached the lat. of 48° N., and coasted southward to the harbour now bearing his name. It was next seen by the Spaniards.

We shall not dwell here upon the much-disputed accounts of De Fuca's voyage in 1592, which will be mentioned elsewhere, nor of Martin de Aguiila in 1603, nor of Admiral Bartolomeo de Fuente, or de Fonte, in 1640. All these have been denied the merit of truth, but there certainly would appear some reason for believing a portion of the first-named narrative. The next or really authentic account of any voyage to this part of the coast is from the Spanish authorities. Ensign Juan Perez sailed from San Blas in the year 1774, and after encountering storms, made the land on July 16th, in lat. 54°, the South point of which was named Cape Santa Margarita, the land being what is now called Queen Charlotte's Island, and the cape, Cape North. He then made Nootka Sound, which he called Port San Lorenzo.

The next, in March, 1775, was under Capt. Bruno Hecceta, under whom was Perez. Don J. de Ayala has been frequently named as chief of the expedition, but was at first in command of the second vessel, the *Sonora*. They made Port Trinidad, North of Cape Mendocino, where they left a cross, which Vancouver found in 1793. They went northward, but being separated by a storm,

Heceta returned, and saw the opening of the mouth of the Columbia, which he called the *Ensenada de Ascencion*; it was also called Heceta's Inlet in some subsequent Spanish charts. Such are the first Spanish voyages.

In 1776, Capt. Cook left Plymouth on his last voyage, and after discovering the Sandwich Islands, in January, 1778, he made the coast 200 miles North of Cape Mendocino, proceeding northwards.

From some notices given respecting the fur to be procured on the coast during Cook's voyage, some vessels fitted out for this region from China, the first of which was under Capt. James Hanna; but, in 1787, Capt. Berkeley discovered an inlet in $48^{\circ} 30'$. In 1788 Capts. Duncan and Colnett were on the coast; and Duncan, running down the coast from the North, anchored on the South coast of a strait off a village called *Claasit*, or *Claaset*, in $48^{\circ} 30'$.

In 1788 Capt. Meares entered this strait, and communicated his discovery to Capt. Gray, of the *Columbia*, in which vessel the latter discovered the great river now known by that name. This fact is recorded by Vancouver, to whose expedition, in 1792, we owed almost the whole of our first knowledge of the coasts. In 1839, the mouth of the Columbia was surveyed by Captain Sir Edward Belcher. The American Exploring Expedition also examined the Columbia River in 1841, and part of the Straits of Juan de Fuca, afterwards more elaborately completed by Capt. Kellett, in 1847. But soon after the transfer of the region to the United States, that government instituted a survey of the coast, the preliminary examination being commenced in 1849 by Lieut. W. A. Bartlett, and subsequently continued by Lieut. McArthur and Commander Jas. Alden, U.S.N. These surveys have in many instances been entirely completed. One of the earliest results of the hydrographical examination of the western coast of the United States was the establishment of the system of admirable lighthouses, which now mark its prominent points.

The Hudson's Bay Company, during this period, having established settlements, derived almost the sole benefit from its productions; but in 1846 it was determined that the right of sole possession should be divided. It was against the claims of England; and the treaty before alluded to stipulated that all South of 42° should belong exclusively to the United States, the navigation of the Columbia River to be open to both parties, and indemnification granted to settlers of either nation on either side of the boundary.*

* The origin of the name "Oregon" is involved in some obscurity. It is, perhaps, first found in some travels in the interior of North America, in 1766-68, by Jonathan Carver, published in London in 1778. He does not state his authority for calling the river by the name of Origan, or Oregon; and it has been supposed by some that it was an invention of his own. It has also been stated that it is from the Spaniards, from the "oregano," or wild marjoram (*origanum*, Lat.), said to grow on its banks.

The native names appear to be very incapable of being rendered into European orthography. Their pronunciation is so very imperfect, that it is almost impossible to arrive at

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According to the census of 1880, the population of Oregon amounted to 174,767, its area amounting to about 96,030 square miles. In 1870 there were 80,923 inhabitants. Agriculture and the raising of cattle are the principal industries. The Indian inhabitants, who are scattered in numerous tribes throughout the territories of Oregon and Washington, are, it is supposed, rapidly decreasing in numbers, from their dissipated lives and their rude treatment of diseases. They acted in many instances as the allies and hunters for the white men settled among them, but on more than one occasion have proved the treachery of the wild man's character.

On the coast between Cape Lookout and Cape Flattery, and up the Columbia to the first rapids, the singular custom prevails among the Indians of compressing the skulls of the infants. Thus the heads of all acquire a remarkable deformity, but which does not appear to affect their intellectual capacity.

Fish is very abundant in these regions, especially salmon; and in the subsequent pages some accounts are given of enormous quantities being found in the fresher water at the heads of the extensive and singular inlets which penetrate the coast to the northward. The salmon is of several varieties, and in the spawning season they ascend the Columbia and other rivers for 600 or 800 miles above the mouth. A singular fact occurs in this migration: one variety ascends the Cowlitz, another the Columbia, another the Willamette, &c., &c., that which is peculiar in one stream never being found in the other. When they are taken in the upper parts of the rivers, they have their tails and fins nearly worn off with the effect of their long and difficult ascent of these rapid streams, and are almost unfit for food.

The climate of western Oregon and Washington is mild, having neither the extremes of heat during the summer, nor of cold during winter; this is probably owing to the prevalence of the S.W. winds, and the mists which they bring with them from the ocean. The winters are short, lasting from December to February, and may be termed open. Snow seldom falls, and, when it does, lasts but a few days. Frosts are, however, early, occurring in the latter part of August, which is accounted for by the proximity of the snowy peaks of the Cascade Range, a mountain or easterly wind invariably causing a great fall in the temperature. These winds are not frequent; and during the summer of 1841 they were noted but a few times. The wet season lasts from November till March; but the rains are not heavy, though frequent, the annual rainfall ranging from 67 to 125 inches, being greatest on the coast of Puget Sound. The climate during winter is not unlike that of England; and as to temperature,

any satisfactory conclusion as to the real names, and each voyager has represented the same word in very different forms, so that an absolute standard must not be expected. Sir George Simpson gives some amusing instances of the imperfection of their powers of speech.

is equally mild with that of 10° lower latitude on the eastern coast of the United States.

Chet-ko River.—About $6\frac{1}{2}$ miles north-westward of Smith River entrance, and in lat. $42^{\circ} 2' 30''$ N., empties this stream, which is from 50 to 60 yards wide at its mouth, with banks about 100 ft. high, and bounded half a mile in shore with very high hills. It appears deep and sluggish, and in August, 1853, was completely closed at its mouth by a heavy gravel beach. The anchorage off it is open and exposed from West to South, with several reefs in and around it. Indian huts were found in great numbers upon both banks, but most of the Indians were engaged higher up the stream in taking salmon.

According to the U.S. survey the shores of Chet-ko Bay or Cove are lined with rocks and shoals, reaching from 1 to 4 cables off, but outside these the depths appear to be regular. There is anchorage in $6\frac{1}{2}$ fathoms, sand, with Bar Rock and Miller's house in line N. by W., the former 2 cables distant. Bar Rock lies $1\frac{1}{2}$ cable S.S.W. from the entrance of the river. It is high water, on full and change, at 11^h ; tides rise 4 feet. The extremity of Chet-ko Point, on the West side of the bay, is in lat. $42^{\circ} 2' 29''$ N., long. $124^{\circ} 17' 37''$ W.

MACK REEF.—About $12\frac{1}{2}$ miles north-westward of Chet-ko Cove is Mack Reef, consisting of a line of rocks above water, extending in a N.W. by N. and S.E. by S. direction, and nearly adjoining the shore at *Crooks Point*; the highest, called *Mack Arch*, 228 ft. high, being at the southern extremity, and unmistakable from the large opening through it. Mack Arch is in lat. $42^{\circ} 13' 37''$ N., long. $124^{\circ} 24' 46''$ W. The coast between the Chet-ko and Mack Point, is high, bold, compact, and bordered by vast numbers of rocks, with very deep water close inshore.

To reach the anchorage behind the reef, steer to pass a short distance eastward of Mack Arch, and when between Mack Reef and the shore, with Mack Arch bearing S. by E. $\frac{1}{4}$ E., and Mack Point N.E. by N. $\frac{1}{4}$ N., there is good anchorage in $6\frac{1}{2}$ fathoms, sandy bottom, with the reef $1\frac{1}{2}$ to 2 cables distant. Northward of this anchorage is an inner anchorage, separated from the outer by a thick belt of kelp, extending from the beach to the reef, but through which there is a clear channel. Bring the highest point of Mack Arch to bear astern S. $\frac{3}{4}$ E., and steer N. $\frac{3}{4}$ W.; this will lead through the channel in from $3\frac{1}{2}$ to 4 fathoms, and avoid a sunken rock with only 2 ft. at low water, which lies at the edge of the kelp on the eastern side. From the northern or inner end of the channel, the course should be altered to the westward, and good anchorage may be had just inside the kelp, in from 4 to 5 fathoms, sand, with Mack Point bearing E. $\frac{3}{4}$ N. and Mack Arch S. by E. $\frac{1}{4}$ E.

Between the rocks forming Mack Reef there are passages leading to the inner and outer anchorages, and apparently free from danger; but they should not be used until more closely examined.

Wood and water can be obtained at Mack Shelter, but no other supplies. It is high water, on full and change, at $11^h 55^m$; tides rise $3\frac{1}{2}$ feet.

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From Crooks Point the shore runs nearly N.W. by N. $\frac{1}{2}$ N. for 36 miles to Cape Orford, making a long gentle curve of 4 miles to the eastward, and being in general high, abrupt, and rocky.

Hunter Cove.—At $4\frac{1}{2}$ miles north-westward of Crooks Point is *Hunter Islet*, connected with the shore, 3 cables distant, by a flat with 12 ft. water over its deepest part. This islet and flat form the South side of the small indentation named Hunter Cove, in which the greatest depth is $4\frac{1}{2}$ fathoms. The entrance is between Hunter Islet and Cape San Sebastian, $2\frac{1}{2}$ cables to the N.W., and may be used by steering about midway between. There is anchorage on the northern side of the cove, in about 3 fathoms.

Rogue River.—Within the long stretch just referred to, and at 7 miles N. by W. $\frac{1}{2}$ W. of Hunter Cove, is found the entrance to Rogue River, in about lat. $42^{\circ} 26' N.$, long. $124^{\circ} 26' W.$, having a long, low, sandy point on the South side, and a high steep hill, with two large rocks off its base, on the North side. It comes from the interior between high mountains, and it is next to impossible to travel along its course. Inside the entrance, and on the North side, were some large Indian villages in 1853.* Just within the entrance is the small town of *Ellensburg*; much salmon is caught here. When passing it in moderate N.W. weather, the sea was breaking heavily across the bar, and this is reported to be generally the case. It has not been surveyed, and the depth of water on the bar is variously reported from 10 to 18 ft.; the former doubtless nearer the truth. Lieut. McArthur reports 10 ft. on the bar, but that the channel is too narrow for sailing vessels to turn in. The bar frequently shifts, and is only crossed by small steamers and coasting vessels. Gold is found on the coast between this and Coquille River.

Rogue River Reef.—The rocky islets composing this reef are not so large as the Crescent City Rocks, and run more nearly parallel with the coast line. The southern group of rocks lies W. $\frac{1}{2}$ N., about 4 miles from the North head of the entrance to Rogue River, and stretches northward 3 miles, where a gap occurs between them and another cluster lying $1\frac{1}{2}$ mile off shore. Off this inner group lie several dangerous sunken rocks, which must be sharply watched from aloft, when the sea is not heavy enough to break upon them. As seen from the southward, the inside rock of the outer group shows a perpendicular face eastward, and sloping back to the West. The channel through this reef is perhaps a mile wide, but more dangerous than any other on the coast. No hydrographic survey has been made of it, and it is never used by the coasting steamers.

Abreast of the northern part of this reef is a five mile stretch of low sand beach, backed by high, rugged, wooded hills, when the shore changes to an

* The name Rogue's River was given to it from the character of the natives. On the maps it is called the *Toutounis*, or *Too-too-tutna*, or *Klamet*.
North Pacific.

abrupt and precipitous face to Port Orford. Many rocks closely border the shore, and 5 miles South of Port Orford a high, rocky islet lies nearly a mile off the base of the hill, about 1,000 ft. high.

PORT ORFORD.—This is by far the best summer roadstead on the coast between Point Royes and the Strait of Juan de Fuca, and it has been proposed to construct a harbour of refuge here. From the extremity of the S.W. point eastward to the main shore the distance is 2 miles, and from this line the greatest bend of the shore northward is 1 mile, forming the port. The soundings within this space range from 16 fathoms close to *Tichenor Rock*, forming the West point of the bay, to 3 fathoms within one-quarter of a mile of the beach on the N.E. side, with 5 fathoms at the base of the rocky points on the N.W. side towards Tichenor Rock. One mile off the shores of the bay the average depth is about 14 fathoms, regularly decreasing inshore.

The point forming the western part of the bay presents a very rugged, precipitous outline, and attains an elevation of 350 ft. Its surface is covered with excellent soil, and with a sparse growth of fir. From this point the shore becomes depressed to about 60 ft., at the northern or middle part of the shore of the bay, where the village is located. The hills behind are covered with a thick growth of fir and cedar.

The anchorage is usually made with the eastern end of the village bearing North, being just open to the East of a high rock on the beach, in 6 fathoms water, hard bottom, having a sharp, high point bearing N.W. by W., a quarter of a mile distant, the beach in front of the village distant a quarter of a mile, and three rocks just in the 3-fathoms line E. by N., distant half a mile. Steamers anchor a little to the eastward of this position, and closer to the village, in 4 fathoms. Coasters from the South in summer beat up close inshore, stretching inside of the outlying islets to avoid the heavy swell outside. Coming from the northward they keep just outside of a high rock one-third of a mile off the western head, and round Tichenor Rock within half a mile. In winter, anchor far enough out to be ready to put to sea when a south-easter comes up. During a protracted gale in December, 1851, a terrible sea rolled in that no vessel could have ridden out. The old steamer *Sea Gull* was driven northward, and lost two weeks in regaining her position, and the mail steamer *Columbia* held her own for many hours off the Orford Reef.

The usual landing is between the rock called *Battle Rock*, North of the anchorage, and the point of rock close on its West side. A road is cut from here up to the village, which consists of but a few houses, and has a lumber-mill. Sometimes a landing is made on the rocky beach a quarter of a mile westward of Battle Rock, in the bight, where a sloping grassy bluff comes to the water; but this landing is over a rocky bottom. A road is cut up the slope to the site of the military post of Port Orford, which is now abandoned.

From Battle Rock the shore eastward is skirted by a sand beach for $1\frac{3}{4}$ mile

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to a rough, rocky point, called *Coal Point*, off which is a cluster of rocks. About midway in this distance empties a small creek, whose banks are composed of a deposit of auriferous sand and gravel, the same as found in front of the village abreast of Battle Rock, and which has yielded as high as 30 to 40 dollars per diem to each miner. A group of rocks extends about half a mile off shore, on the N.W. side of the creek. Battle Rock was so named because the first adventurers made a stand against the Indians on this rock in June, 1851. *Coal Point* was so named from the reported existence of coal in this vicinity.

Several attempts have been made to open a road from this place to the mines about 60 or 70 miles eastward, but thus far without success. Several parties have gone through, but could find no direct available route for pack animals. Upon the opening of such a road it would become a large depôt of supply for the interior. In the neighbourhood of Port Orford are found immense quantities of the largest and finest white cedar on the coast, and large saw-mills are in operation, affording a supply of this lumber for the San Francisco market, unapproachable in quality by any on the Atlantic coast. The high mountain about 12 miles East of Port Orford is called *Pilot Knob*. This bay was called *Ewing Harbour* in 1850 by Lieut. McArthur, but is now known by no other name than *Port Orford* from its proximity to Cape Orford.

It is high water in Port Orford (corrected establishment) at $11^h 26^m$; mean rise and fall 5.1 ft.; of spring tides 6 ft. 10 in.; neaps 3 ft. 8 in. The top of the ridge West of the village is in about lat. $42^\circ 44' 22''$ N., long. $124^\circ 30'$ W.

From the western extremity of Port Orford, Cape Orford or Blanco bears N.W. $\frac{1}{2}$ N., distant $6\frac{1}{2}$ miles, the shore line between them curving eastward about a mile. *Klooqueh Rock* lies about 3 cables off shore, nearly a mile N.W. by W. of Tichenor Rock. Immediately North of Port Orford the shore is composed of a very broad loose sand beach, backed by a long uniform sand ridge of 100 ft. in height, covered with grass, fern, sallal bushes, and a few firs; while behind this the ground falls and forms lagoons and marshes. This ridge extends nearly to the mouth of a stream called *Elk River*, $4\frac{1}{2}$ miles from Tichenor Rock. This narrow stream, fordable at its mouth at low tides, comes for miles through broad marshes covered with fir and white cedar, and an almost impenetrable undergrowth. The South side at the mouth is low, sandy, and flat; the North side, a slope rising from the marsh inshore, and terminating on the beach in a perpendicular bluff, averaging 100 ft. high, covered with timber to its very edge for a couple of miles, when the timber retreats some distance inland. The face of this bluff exhibits vast numbers of fossil shells in the sandstone. At its base a sand beach exists which may be travelled at low water.

CAPE ORFORD or BLANCO.—In making this cape from the northward or southward, it presents a great similarity to Point Concepcion, appearing

first as an island, because the neck connecting it with the main is comparatively low, flat, and destitute of trees, with which the cape is heavily covered to the edge of the cliff. It is perhaps over 200 ft. high, but the trees upon it make it appear at least 100 ft. more. The sides are very steep, and worn away by the action of the sea, showing a dull whitish appearance usually, but bright when the sun is shining upon them.* At the base are many black rocks and ledges stretching out to form the inner part of Orford Reef. In the bend S.E. of the cape, rises a high, large, single rock, about 100 yards from the beach. The approximate geographical position of the cape is lat. $42^{\circ} 50' N.$, long. $124^{\circ} 33' W.$, being thus the most western part of the main land until lat. $47^{\circ} 50'$ is reached.

The **LIGHTHOUSE** on Cape Orford is a white tower, 50 ft. high, standing on the highest part of the cape. It shows a *fixed bright* light, elevated 256 ft., and visible 23 miles.

ORFORD REEF, about 4 miles off the coast, between Port and Cape Orford, is a group of rocky islets and sunken rocks. There are seven large high ones within an area of 1 square mile, with small ones that are just awash, and others upon which the sea only breaks in very heavy weather.

The south-eastern rock is called *Fin Rock*, and has a perpendicular face to the S.W., with a sloping surface to the N.E. Near it are several low black rocks. *Fin Rock* lies W. $\frac{1}{2}$ N. distant $4\frac{1}{2}$ miles from the western point of Port Orford, and the general direction of the six others is N.N.W. from *Fin Rock*. West of Port Orford, and distant $4\frac{1}{2}$ miles, is a small black rock, and near it is a smaller one, upon which the sea breaks only occasionally. At $4\frac{1}{2}$ miles W. by N. $\frac{1}{2}$ N. from Port Orford, lies the largest of the seven islets, rising up with high and nearly perpendicular sides. On the same course, and $1\frac{1}{2}$ mile further out, is a small rock, and halfway between them is a rock awash. This is the northern limit of the group.

Stretching S.S.W. for $1\frac{1}{2}$ mile from Cape Orford are numerous rocky islets and sunken rocks, with large fields of kelp; but ceasing at that distance a passage is left $1\frac{1}{2}$ mile wide between them and the northern islets of the other group, with 9 to 19 fathoms in it. This passage is in constant use by mail and coasting steamers, but great caution is necessary to avoid the sunken rocks on either side.

At 1 mile North of Cape Orford is a small stream having a great number of rocks off its mouth. In 1851 it was usually called *Sikhs River*, the Chinook "jargon" name for friend. On some maps we find a stream near this locality called *Sequalchin River*. The village upon the Sikhs is called *Te-cheh-quut*.

* It was named Cape Blanco on the old Spanish maps, from the assertion of Antonio Flores in 1603, but the name Cape Orford was given by Vancouver in 1792, in honour of his much respected friend the noble Earl (George) of that title.

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At 10 miles North of Cape Orford, La Pérouse places a cape called *Toledo*, but no headland exists between Orford and the South head of the Coquille, although a small stream called *Flora's Creek* empties upon the coast about halfway between them.

Northward of Cape Orford the appearance and nature of the coast assumes a marked change. Long reaches of low white sand beach occur, with sand dunes, broken by bold rocky headlands, and backed by high irregular ridges of mountains. On the sea-face and southern sides of many of these prominent points no timber grows, and they present a bright lively green of fern, grass, and bushes. The general altitude of the mountains appears the same as to the southward.

COQUILLE RIVER.—From Cape Orford to the mouth of the Coquille, in lat. $43^{\circ} 8'$, the coast runs exactly North for 18 miles, with a slight curve of $1\frac{1}{2}$ mile eastward, and a short distance North of Cape Orford, consists of a low sand beach, immediately behind which are long shallow lagoons, receiving the water from the mountains, but having no visible outlet to the sea. Along this shore the soundings range from 7 to 15 fathoms at a distance of a mile.

The South point of the entrance to Coquille River is a high bluff headland, while the North point is a long, low, narrow spit of sand, overlapping, as it were, the southern head, so that the channel runs parallel with and close under it (1851). A short distance off it lie several rocks, but not of sufficient size to lessen the western swell which breaks continually across the bar.

The entrance is about 200 yards across in its widest part, and it then spreads out into a large sheet of shallow water, into the N.E. part of which the river runs from the interior. It drains a very fertile region, densely covered with many varieties of wood. Numerous Indian encampments were found along its banks from the mouth, and quite extensive fish weirs were discovered and destroyed. About 15 miles from its mouth there is a portage of $1\frac{1}{2}$ mile to Koos River.

The hydrographic reconnaissance of this river in 1859 by the Coast Survey shows only 3 ft. of water on the bar, and it was reported inaccessible for vessels of ordinary draught. The North point is a long stretch of dreary sand dunes, and has a single bold rock at its southern extremity. The channel made out straight from the southern head, and North of the rocks. The approximate position of its entrance is lat. $43^{\circ} 8' N.$, long. $124^{\circ} 25' W.$

Works are now in progress for deepening the channel over the bar, by constructing jetties, and in 1883 there was a depth of 7 ft. at low water. There is a small steam-tug here. Timber is exported to San Francisco.

CAPE GREGORY or Arago.—Between Coquille River and this headland there is another low sand beach for 10 miles to the southern part of Cape Gregory, which rises up very precipitously; the hill, attaining perhaps 2,000 ft. elevation 2 miles back, runs in a straight line northward for 3 or 4 miles, and

bounded by many rocks, slopes to the northward to a sharp perpendicular point, about 60 ft. high, and peculiarly cut and worn by the action of the sea. Thence it takes a sharp turn to the E.N.E. for 2 miles, to the entrance of Koos Bay. The cape, as seen from the southward, shows a couple of rocks a short distance from its western point. Along the low shore, soundings in 10 fathoms are found 1 mile off.

It is stated that vessels anchoring under the North face of the cape may ride out heavy S.E. gales. If so, it is very important, no other place between Sir Francis Drake's and Neé-ah Bays being known to afford that protection. If a south-easter should haul to the S.W., and then N.W., as they usually do, the chances of getting out would be very few. A *lifeboat* is stationed here.

It was named by Capt. Cook, who placed it by bearings in lat. $43^{\circ} 30'$, and is described by him as follows: "This point is rendered remarkable by the land of it rising immediately from the sea to a tolerable height, and that on each side of it is very low." Vancouver placed it in $43^{\circ} 23'$. It is sometimes called by the recent appellation of Arago, which has been adopted on the Coast Survey charts. It is known by both on the western coast.

The **LIGHTHOUSE** at Cape Gregory stands on a small island off the western extremity of the cape, the keeper's white house being 350 yards from it, at the South end of the island. The tower is of iron, painted white, and 25 ft. high; it shows a *fixed bright* light, varied by a *flash* and eclipse, each of 3 seconds duration, every 2 minutes; elevated 75 ft., and visible 14 miles. Lat. $40^{\circ} 20' 38''$ N., long. $124^{\circ} 22' 11''$ W.

KOOS BAY.—Nearly 2 miles E.N.E. of the northern extremity of Cape Gregory is the wide and well-marked entrance to Koos or Coos Bay. The South point, named *Koos Head*, is high and bold, being the base of the hills forming the cape, whilst the North point is low and sandy, with shifting sand dunes that reach 100 ft. in height. In 1861 a narrow channel cut across the North point, forming a tolerably large island, which was washed away before the close of the season. Such changes are constantly taking place, and involve changes in the bar and channel. The points lie nearly North and South of each other, and about three-quarters of a mile apart. About a cable off Koos Head is an isolated rock named *Guano Rock*.

The bar, in 1865, was N. by W. $\frac{1}{4}$ W., $1\frac{1}{4}$ mile from Koos Head; $2\frac{1}{2}$ miles to the N.N.E. of Cape Gregory lighthouse; and its width between the breakers on the East and West sides was less than 1 cable, with 4 fathoms at the entrance, shoaling to 7 ft. farther in. From the inner part of the bar, the channel increases in width, and deepens to 10 fathoms off Koos Head.

In 1880 an automatic *Whistle buoy*, painted in *black* and *white stripes*, was moored in 15 fathoms, $1\frac{1}{4}$ mile W. by N. $\frac{1}{4}$ N. from the outer part of the bar, with Cape Gregory lighthouse bearing S. by E. $\frac{1}{4}$ E., distant $1\frac{1}{2}$ mile. A buoy is also moored on the inner side of the bar.

In 1853 and 1854 a depth of only 9 to $9\frac{1}{2}$ ft. could be found on the bar.

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During the working season of 1861 the bar, which then had 13 ft. over it, moved to the northward, thus indicating great changes in this as in all other river bars on the coast. Between 1861 and 1865 it had shifted about 6 cables to the N.N.E. Vessels enter and leave on the flood-tide, because the bar is smoother; with the ebb there is a heavy break, unless the sea be remarkably smooth. In moderate N.W. weather the sea has been observed to break completely across the entrance. The currents run very strongly, as might be supposed from the extent of the bay and size of the channel. A tug-boat is employed at the entrance for towing vessels over the bar. It is high water, on full and change, at 11^h 26^m; springs rise 6 $\frac{1}{2}$ ft., neaps 5 $\frac{1}{2}$ feet.

Empire City lies on the East side of the river, about 3 $\frac{1}{2}$ miles above the bar. Traffic is drawn hither by the mining of lignite, which is carried to the San Francisco market in schooners; it has been found unfit for steam-ship consumption, but is used for small stationary engines and domestic purposes. The geology of the country does not give promise of true coal. There are several mines, and in 1883, 25,000 tons were shipped, a diminution as compared with previous years, the coal being of inferior quality to that obtained from Washington Territory. There are four saw-mills on the bay, turning out about 115,000 ft. of lumber daily. There are also some ship-building yards, where vessels have been built up to 2,000 tons.

Works are now in progress for improving the channel over the bar, by constructing jetties, which are stated to have already caused an increase in the depth of water.

The bay is very irregular in outline, and its general shape is like the letter U, with the convexity to the North. One small branch stretches southward behind Koos Head; it is called the South Slough, and has but 2 or 3 ft. of water in it. North of the entrance the bay proper begins, and has a good depth of water. Abreast of the North point the width is 600 yards, and the depth from 3 to 7 fathoms; thence northward it increases in width to nearly a mile, and runs very straight on a N. by E. $\frac{1}{2}$ E. course. The channel runs on the eastern side of this part, the western half being filled with sand flats and shallows. A sunken rock, called *Fearless Rock*, lies on the eastern side of the channel, abreast of the upper part of the rocky shore, and is marked by a buoy. The whole length of the bay is estimated to be about 25 miles, the head of it being a little further South than the entrance.

Koos River empties into the head of the bay, and will give passage to boats for 20 miles from its mouth, where a small slough that empties into Coquille River is so near as to leave a portage of only 1 $\frac{1}{2}$ mile between the two waters, and about 15 miles from the mouth of the Coquille.

Excepting the peninsula, which forms the western shore of the bay North of the entrance, the entire country is an immense forest of various kinds of pines. No land for cultivation is found without clearing, and even on Koos River the bottom lands, which afford excellent soil, have to be cleared of the

thick growth of laurel, maple, and myrtle. The coal mines are beyond the great bend, near the head of the bay, and on the western side.

The name *Koos* is that approaching nearest the Indian pronunciation of the word. On some maps we find a stream called *Cahoos* or *Kowes*, emptying just South of Cape Gregory.*

UMPQUAH RIVER.—North of *Koos Bay* to the *Umpquah River* is another straight low sand beach, with sand dunes, backed by a high ridge of hills densely timbered. The shore runs nearly North, presenting a very white appearance when the sun shines upon it, and having from 10 to 15 fathoms of water 1 mile off the beach. The southern point of the entrance to the river is a marked spur of the mountains from the S.E., and is bordered by sand dunes. The North side of the entrance is a long range of white shifting sand-hills, running with the coast for 2 miles, and suddenly changing to high rocky hills, covered with wood.

Umpquah River is the largest stream entering the Pacific between the *Sacramento* and *Columbia Rivers*. It is 51 miles N. $\frac{1}{2}$ W. from *Cape Orford*, and 21 miles North of *Cape Gregory*. The lower reach of the river is long and narrow, running nearly North for 6 miles; bordered on the South side by a rocky wooded shore, and on the North, for 2 miles, by loose sand-hills, changing, after the first mile, to sand sparsely covered with coarse grass, bushes and fir, and in 4 miles to steep, high, rocky banks, covered with large trees. An immense flat, mostly bare at low water, stretches South from the North point to within 300 yards of the South side of the entrance, through which narrow space runs the channel, having a bar with only 13 ft. upon it in 1853, and less than 100 yards wide. From the bar the point of bluff just inside the entrance bore N.E. by E., distant $1\frac{1}{2}$ mile. In 1881 the depth on the bar was stated to be 18 ft.

The bar is subject to great and frequent changes, and should not be attempted by a stranger. In light weather the breakers on each side point out the channel, but with a heavy swell the sea is terrific. Several vessels have been lost here, and on one occasion a steamer, which had struck on the bar in entering, was detained for several weeks, the depth having so much decreased. Vessels which can cross the bar can ascend as far as *Gardner City*, 5 miles above the bar; small vessels can reach *Scottsburg*, 20 miles farther.

In 1851 or 1852 two range marks were placed on the South shore for running in by, and they are frequently referred to as data by which to trace the changes of the bar, but the captain who erected them assured the surveyors that the bar was not on their range, but to the southward of it.

Buoys for crossing the bar.—In January, 1858, it was announced that the

* The word *Koos* signifies in the *Too-too-tan* language a lake, lagoon, or landlocked bay. *Duflot de Mofras* very amusingly translates it *R. de Vaches* (cows river).

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bar had been marked by two nun buoys, painted in black and white stripes. The inner buoy was moored just within the bar, and in $3\frac{1}{2}$ fathoms at mean low water, and could be passed on either hand, but only close to it. The outer buoy was placed just outside the bar, in 10 fathoms at the same stage of the tide, and could also be passed on either hand. Keeping the two buoys in range with the lighthouse, which stood on the South side of the entrance close to the beach, which is of shifting sand, and E. by N. $\frac{1}{4}$ N. about 1 mile from the outer buoy, 14 ft. could be carried over the bar at mean low water. The light was discontinued in 1866, but it was not stated whether the lighthouse and the buoys were removed.

After crossing the bar the channel runs close to the South shore, and increases in depth from $3\frac{1}{2}$ fathoms to 14 fathoms off the point of the bluff. Abreast of the meeting of the sand beach and bluff on the South side lies a rock, visible at extreme low tide, upon the 3-fathoms line. Its position has not been accurately determined. From the point of the bluff vessels steer across the river to strike the East side of the North point about one-third of a mile from its extremity, then haul across E.N.E. to the other shore, close along which the channel runs. This course takes them clear of a flat and rocks in mid-river, and bearing E.N.E. from the South end of the North point, and North five-eighths of a mile from the point of the bluff on the South side. The small indentation of the shore-line on the right, after making the first stretch from the point of the bluff, is called *Winchester Bay*, and is but an extensive mud-flat. For 3 miles inside the bar the river continues half a mile wide, then expands to a mile, and is filled with numerous extensive sand and mud-flats. At 5 miles from the lighthouse it bends sharply to the eastward.

This river is said to drain an extremely fertile region, abounding in prairie land, well adapted to agriculture and grazing. Ross Cox mentions a pine tree discovered in the Umpquah valley, measuring 216 ft. to its lowest branches, and 57 ft. in circumference. The Indian name for the river below the rapids is Kah-la-wat-set, and to the upper part they apply the name Ump't'quah. Much salmon is caught here.

From the Umpquah the coast runs in a remarkably straight line N. by W. $\frac{1}{4}$ W. to the South point of the entrance to Columbia River, in no case varying more than 3 miles eastward of the line joining these two places.

HECETA BANK.—At 66 miles N.W. by N. from Cape Orford is the southern end of a bank extending parallel with the coast for 30 miles, and about the same distance from it. The least depth yet discovered upon it is 43 fathoms, and the nature of the bottom very variable, there being blue mud, coarse blue sand, coral, pebbles, gravel, mud, and shells. Coasting vessels have often reported passing over localities having a heavy swell upon them, and one frequently so reported near the Umpquah led to the examination which discovered this bank.

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When Heceta was upon this coast, and in this vicinity, he said, "On Sunday I found great differences (of depth) at 7 leagues. I got bottom at 80 fathoms, and nearer the coast I sometimes found no bottom." Should a thorough examination of his discoveries here satisfactorily show that he did really cross this or any yet undiscovered adjacent bank, it would be a tribute to his explorations on this coast to apply his name to it.

After leaving the Umpquah, 2 or 3 miles, a bold rocky coast, with high steep hills covered with timber, runs straight for about 8 miles, changing to low sandy beach with sand dunes, backed by a high ridge of hills. This continues for 15 miles, when the hills stretch out to the shore, and crowd upon it for 13 miles, to end abruptly in steep bluffs forming Cape Perpetua. At 7 and 11 miles, respectively, northward of the Umpquah are *Takhenitch Creek* and *Tsilcoos River*, which lead to some lagoons 1 or 2 miles inland. *Cape Heceta*, the northern limit of the sand dunes above described, is about 800 ft. high, and covered with wood, but the seaward face, which is $1\frac{1}{2}$ or 2 miles in extent, is green to the edge of the cliff. Its northern extremity is in about lat. $44^{\circ} 9' N.$, near which is a small sandy cove; two small cascades are seen near the southern part.

CAPE PERPETUA is 39 miles N. by W. $\frac{1}{4}$ W. from the Umpquah, its approximate geographical position being lat. $44^{\circ} 19' N.$, long. $124^{\circ} 6' W.$ This cape was named by Cook in 1778. The face of the cape is nearly 5 miles long, with a very slight projection from the straight trend of the shore. It is very high, and has a regular though steep descent to the shore, bringing the trees to its very edge. To the northward of Perpetua the coast range of hills is cut by numerous valleys, through which flow many small streams to the ocean.

From the Umpquah to Cape Perpetua, at a distance of a mile from the shore, soundings are laid down from 8 to 14 fathoms. From thence to Cape Foulweather the soundings range from 7 to 12 fathoms at the same distance off.

Alseya River.—Northward of Cape Perpetua the shore continues straight, high, and bold, and at $8\frac{1}{2}$ miles distant is Alseya River, which expands, within its narrow entrance, nearly to the size of Yaquina River. A broad sandy point forms its North head; the depth on the bar is uncertain. Northward of Alseya River the shore is marked by sand dunes for 4 miles, or as far as *Seal Rocks*, southward of Beaver Creek. Thence to the Yaquina River the shore is low, and thickly wooded.

YAQUINA RIVER.—At 21 miles N. by W. $\frac{1}{4}$ W. of Cape Perpetua is the entrance to Yaquina River, the northern head of which, as seen from the S.W., appears as a bold sandy bluff, surmounted by a clump of fir-trees near the southern extremity; a line of low black rocks extends about 4 cables S. by W. from the bluff. The South point is lower than the northern, and is thickly wooded nearly to the beach. The interior country is hilly, and also thickly wooded.

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The bar extends away from the rocks off the North head, and is never free from breakers on each side of the channel, except at extreme high water, when it appears about half a mile wide. The depth on the bar was 9 ft. at low water, at the time of the survey in 1870, but jetties are now under construction, to improve the entrance, which has already deepened in consequence; and the engineers expect to increase it to 17 ft. at low water by continuing the works. The bar is reported to be smoothest in June, July, and August; and the summer winds are favourable for entering or leaving. The current runs at 5 or 6 knots between the heads when strongest.

About three-quarters of a mile from the shore, and at a quarter of a mile outside the bar, is a very dangerous reef, about $1\frac{1}{2}$ mile long North and South, consisting of numerous rocks with 6 to 18 ft. upon them at low water. This reef, however, acts as a breakwater against the westerly seas. A dangerous 12-ft. rock, which breaks at low water, lies south-westward of the entrance, and about a mile off shore.

A beacon was built upon the North head, as a guide for making the entrance; and two beacons were placed on the southern point as a range for crossing the bar. A *black buoy* is moored in $6\frac{1}{2}$ fathoms, just outside the bar, and nearly $1\frac{1}{2}$ mile S.W. by S. from the North head. At a mile N.E. $\frac{1}{2}$ E. from this buoy is a *black and white buoy*, marking the inner edge of the bar, the channel between lying on a curve southward of this line. Above the latter buoy the channel deepens to 6 fathoms, between the heads, and off Newport a *red buoy* is moored on the East side of the narrow channel, which runs near the western shore.

The town of *Newport* consists of about twenty or thirty houses, built on the East side of the North head, and facing the large expanse of shallow water known as *Yaquina Bay*, through which the river runs in a narrow channel. Oysters are abundant here, and are shipped to San Francisco. There are also some saw-mills. The town is in lat. $44^{\circ} 40' 30''$ N., long. $124^{\circ} 4' 45''$ W. It is high water, on full and change, at 12^h; springs rise $7\frac{1}{4}$ ft.

A railway is being constructed from Yaquina Bay to join the line from Portland at Corvallis, about 60 miles inland, in the fertile Willamette valley. It is expected that when this railway is completed, and the harbour works have made the entrance safe for large vessels, a large trade will arise here.

Above Newport the river takes a general E.N.E. direction to *Elk City*, a distance of 12 miles in a straight line, but about 23 miles by the windings of the river; a depth of 9 ft. can be carried up as far as this. A small steamer plies between the two places.

Vessels bound for the Yaquina from the southward should first make *Capo Perpetua*, $22\frac{1}{2}$ miles southward of the river, and endeavour to keep the shore in sight up to the entrance, and carefully avoid the 12-ft. rock lying south-westward of the latter. Vessels from the northward should sight Yaquina

Head, with its lighthouse, which will serve as a guide to the river entrance, $3\frac{1}{2}$ miles to the southward. The buoys marking the bar, and the beacons, if still existing, will then point out the bar channel, but a pilot would be necessary for a stranger.

YAQUINA HEAD and LIGHTHOUSE.—From the North head of Yaquina River the shore, for $3\frac{1}{2}$ miles to N.N.W., is a long line of bluffs, 100 to 200 ft. high, with shoal water off it, as far as Yaquina Head, southward of Cape Foulweather. Yaquina Head is a high, bold point, extending about half a mile into the sea from the low beach, with two conical hills on it, 300 to 400 ft. high, backed by high mountains. When 2 or 3 miles off the river, its grassy heads show against the bolder headland of Cape Foulweather. On its extreme point stands a white lighthouse, 81 ft. high, showing a *fixed bright* light, elevated 161 ft., and visible 19 miles. Lat. $44^{\circ} 43' 30''$ N., long. $124^{\circ} 5' W.$

CAPE FOULWEATHER.—There seems to have been some uncertainty as to the exact position of this cape, the point now known as Yaquina Head being marked as Cape Foulweather on some charts. This cape was named by Cook on the day he made the coast, March 6th, 1778, but the point of the headland is not that referred to by him. At noon he was in lat. $44^{\circ} 33'$, and the land extended from N.E. $\frac{1}{2}$ N. to S.E. by S., about 8 leagues distant. In this situation he had 73 fathoms over a muddy bottom, and 90 fathoms a league farther off shore. The land he describes of moderate height, diversified by hills and valleys, and principally covered with wood. No striking object presented itself, except a high hill with a flat summit, which bore East from him at noon. This may have been what he subsequently called Cape Perpetua. At the northern extreme the land formed a point, which he named Cape Foulweather, from the exceedingly bad weather he met with soon after. The expression "northern extreme" has led some geographers to place the cape as high as lat. $45\frac{1}{2}^{\circ}$, but he judged the Foulweather he named to be in lat. $44^{\circ} 55'$. Being here driven off the coast by continued bad weather, he had no opportunity to verify his position, and did not sight the land again till in lat. $47^{\circ} 5'$, thus passing by the entrance to the Columbia. Vancouver places it in lat. $44^{\circ} 49'$. Both of these determinations evidently refer to the northern part of the high land, now known as Cape Foulweather.

About 4 miles northward of Yaquina Head commences the long, bold face of the headland now known as Cape Foulweather. Low yellow cliffs line the shore, and at nearly 3 miles from Yaquina Head a low black rock lies half a mile off shore; just southward of the southern limit of Cape Foulweather is a large rock, the same distance off. The sea-face of the cape is about $5\frac{1}{2}$ miles in extent N.N.W. and S.S.E., and is marked by six or seven sloping grassy heads, crowned with trees. Its elevation is estimated to be about 800 ft. Northward of its westernmost point, which is about 7 miles northward of Yaquina Head, is a small cove, behind a black point covered with trees, with

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Nekas River.—Soon after passing Cape Foulweather the shore becomes abrupt and moderately high, with an increased depth of water immediately off it. At 4 miles South of the Nekas, which is in lat. $44^{\circ} 57'$, it changes to low sand dunes, stretching into a narrow point, forming the South point of the stream, while the North point is a low bluff. The entrance is very narrow and shoal, and inside the river is reported to spread out into a bay of about a mile in extent, and to receive the waters of a stream draining a valley coming from the eastward.

From the Nekas to Cape Lookout the distance is 24 miles, and the course N. by W. $\frac{1}{2}$ W., with a shore-line broken by several small streams, amongst which are the *Nechesne*, in lat. $45^{\circ} 3'$, with rocks in the entrance; the *Nestuggah*, in lat. $45^{\circ} 7'$, called *Yaguinnah* in the reconnaissance of 1850, and having a large rock off its mouth; and the *Nawuggah*, in lat. $45^{\circ} 14'$, having on the South side of its entrance the *Haystack*, a single rocky islet, hereafter referred to. De Mofras has Cape Lucuat in this latitude, and a small stream, River Kaouai, South of it.

Cascade Head, on the North side of the entrance to Nechesne River, is a rugged headland, about a mile in extent, the summit of which, 600 or 700 ft. high, is covered with trees. It is so named from two cascades which fall into the sea about two-thirds of the distance from its southern extremity. From the northward two rocks are seen just southward of the head, the outer one having two arches through it. From the southward two or three large trees may be observed standing alone, above the surface of the second higher seaward slope, elevated about 500 ft.

The South face of Cascade Head, which appears very green, and is bare of trees, overlooks the entrance to *Nechesne River*, which is an inlet about half a mile wide, with a stream running into its head. The shore between this river and Nekas River, to the southward, is low and sandy. Northward of Cascade Head a timbered valley opens upon the beach, and northward of this the shore is lined by undulating green hillocks as far as the mouth of a stream, 9 miles from Cascade Head, having a high rock off its northern point.

Haystack Rock, about 12 miles northward of Cascade Head, and 8 miles southward of Cape Lookout, is a high, rocky islet, lying off the entrance of *Nawuggah River*; it is estimated to be 307 ft. high, and about half a mile north-eastward of it is *Haystack Point*, a low sandstone cliff, worn into caverns, and its summit covered with grass.

CAPE LOOKOUT.—The soundings from Cape Foulweather to this cape show from 13 to 21 fathoms of water at a distance of a mile from the shore, increasing from 18 fathoms North of lat. $45^{\circ} N.$ From Cape Lookout to Cape Falcon, or False Tillamook, a depth of 20 fathoms may generally be found a

mile from shore; but, as upon the whole coast, a heavy regular swell rolls in from the West.

Cape Lookout, 18 miles northward of Cascade Head, is situated in about lat. $45^{\circ} 21' N.$, long. $123^{\circ} 58' W.$ It projects somewhat sharply into the sea for half a mile, and, as seen from the South, the top is tolerably flat and regular, and at the highest part is estimated to attain an elevation of 3,000 ft. The face directly toward the ocean is perpendicular, high, and towards the South destitute of trees. About 8 miles southward of it, Haystack Rock, off the Nawuggah, stands well out from the low sand beach behind it. *Arch Rock* lies off this cape, and one appears very close inshore, about a mile to the northward of it.

CAPE MEARES.—Two or three miles after leaving Cape Lookout the land falls to a low sand beach, behind which is a long lagoon, called the *Nat-a-hais*, or *Oyster Bay*, having an opening under the South head of Cape Meares, or La Mesa, the well-marked point to the northward, which is the termination of a spur or ridge, running from the south-eastward, presenting an abrupt front to the ocean for about 2 miles, and being part of the western boundary of Tillamook Bay. Cape Meares is about 1,200 ft. high, and covered with trees, its face being broken and bluff. Off it lie several arched rocks; in approaching from the southward four large rocks show off the cape, two having arches through them. These rocks are about 150 ft. high, except the outermost, which is smaller.

In coming down this coast in the fall of 1857, the surveyors made a few notes upon some objects, and the following memorandum was made whilst near this point: "Three high rocks (one arch) off the point South of False Tillamook; one more on the North side." Not being then aware of any doubt as to the name of the cape, no other particulars were noted. Four rocks were laid down off the S.W. face on the Coast Survey reconnaissance of 1850, and one on the North. Three large rocks and one small one are laid down off the S.W. face in the original sheets of the reconnaissance of 1853, the most distant being 1 mile from shore, with several small ones between them and the shore, and two or three others off the N.W. face.

TILLAMOOK BAY.—From Cape Meares the land falls to a low narrow peninsula of sand dunes, 40 or 50 ft. high, running N.W. by W., and covered with trees for 3 miles, and then with grass and bushes for another mile, to the entrance of Tillamook Bay, which is 23 miles southward of Tillamook Head. The North side of the entrance rises abruptly to wooded hills, 1,200 ft. high, and just within it is *Green Hill*, 420 ft. high, of a bright green appearance, and destitute of trees.

In 1867 the bar off the entrance was about $1\frac{1}{2}$ mile south-westward of Green Hill, and three-quarters of a mile from the nearest part of the North head. The channel over it was narrow, but quite straight, and a depth of 15 ft. could be carried through it at low water. The entrance to the bay is 3 cables wide,

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but the channel is only two-thirds of a cable wide between the 2-fathoms lines. The narrowest part, 4 to 8 fathoms deep, is close to the foot of Green Hill, the breakers always showing the South side.

Within the entrance, Tillamook Bay extends about 6 miles to the S.E., rapidly expanding to a width of 3 miles, mostly occupied by flats bare at low water. It is said that vessels drawing 8 or 10 ft. water can go 6 miles up the river at the head at high water. A few small vessels have been built here. The settlement named *Clark* is situated on the northern shore of the bay, near its head.

About $1\frac{1}{2}$ mile northward of the bar of Tillamook Bay are *Double-headed Rocks*, connected with the sand beach at low water; they are about 80 ft. high, of a gray colour, the southern one having an arch through it, when seen from the southward. From thence the coast runs, nearly straight, 10 or 11 miles to Cape Falcon or False Tillamook, a considerable stream, called the *Nehalem*, falling into the sea at about one-third of the distance.

Nehalem River.—The narrow entrance of this river is in about latitude $45^{\circ} 40' N.$, and has very little water, but it deepens within; the sea breaks almost unceasingly upon the bar. For the first 3 miles northward of its mouth the river is separated from the sea by a sandy peninsula, and it then bends away to the N.E. A good deal of salmon is caught here. The shore about the river is low and sandy, with sand dunes backed by high, wooded hills, and cut up by many valleys. It was here that Mearns stood in for an anchorage (July, 1788), until he found bottom in 10 fathoms, but hauled out again, and named the place Quicksand Bay, and the adjoining headland North, Cape Grenville.

Clarke, when about 5 miles South of Tillamook Head, says that "the principal town of the Killamucks is situated 20 miles lower (South) at the entrance to a creek called Niece, expanding into a bay which he named Killamucks Bay. Upon this bay were several Killamuck towns. Killamuck River is at the head of the bay, 100 yards wide, and very rapid; but having no perpendicular fall, is a great avenue for trade. There are two small villages of Killamucks settled above its mouth, and the whole trading portion of the tribe ascend it, till by a short portage they carry their canoes to the Columbia valley, and descend the Multnomah to Wappatoo Island." This information he obtained from Indians and traders. On this short expedition he made all his distances from Cape Disappointment and Point Adams too great, and reducing the forementioned 20 miles by the proper proportion, it would give us 13 miles as about the position of the Nehalem. His name seems to agree with this, but the description applies to what is generally known as Tillamook Bay.

CAPE FALCON, or False Tillamook.—The northern part of this headland lies in lat. $45^{\circ} 47' N.$, long. $123^{\circ} 58' W.$ It is about 720 ft. high, with the sea-face coming precipitously to the ocean. As seen from the southward, the top is irregular, while the hills inshore fall away. Like some other points in

this latitude, the southern face of the cape is destitute of trees, but covered with a thick growth of grass, bushes, and fern. Several rocks lie off the cape, one named *Falcon* or *Last Rock*, 50 ft. high, lying three-quarters of a mile from the land. About 2 miles northward of the cape, and nearly a mile off shore, is another isolated rock, 113 ft. high.

At 2 miles South of Cape Falcon is a stretch of sand beach and sand dunes, and about three-quarters of a mile southward of it is a double-headed peak, about 1,200 ft. high, covered with grass to the summit, and named *Ne-ah-kah-nie* by the Indians. At the base, on the South side of the mountains, is a large house.

TILLAMOOK HEAD.—This prominent cape, in lat. $45^{\circ} 58'$, is 11 miles N.N.W. from Cape Falcon, and 20 miles S.E. by S. $\frac{1}{2}$ S. from Cape Disappointment. The coast from Cape Falcon curves about a mile eastward; it is bold and rugged, guarded by many high rocky islets and reefs, and in several places bordered by a low sand beach at the base of the cliffs. At 2 miles southward of the head, Clarke (1805-6) locates a creek 80 yards wide at its mouth, which he calls Ecola, or Whale Creek, now known as Elk Creek. Some rocks lie off the coast, *Arch Rock*, 140 ft. high, lying a quarter of a mile off, in lat. $45^{\circ} 55' N.$

From the South bar of Columbia River the summit of Tillamook Head appears flat for some distance back, and has an estimated height of 1,250 ft. Off the face of the cape, which is very steep, lie several rocky islets; one of them, named *Tillamook Rock*, on which is the lighthouse, is 115 ft. high, and rugged, and stands out about a mile from the S.W. face. Around it the water is believed to be deep, a steamer having come almost upon it in a thick fog, but inside of it lie several high rocks. An isolated rock, just above water, lies about midway between the rock and the head, and though the least water close to either of these rocks is 15 fathoms, strangers should not attempt the passage, as the currents are strong and irregular. From the bar of Columbia River two rocks can be distinctly seen, the inner being the larger, and its apparent distance from the head about half the apparent height of the cape. As seen from the southward, the large rock has a perpendicular face to the westward, and slopes to the East. It is the resort of thousands of seals. Vessels should not pass inside of the line joining Tillamook Rock and Last or Falcon Rock.

The **LIGHTHOUSE** on Tillamook Rock is 48 ft. high, and painted white; it shows a *bright flashing* light, with a flash every 5 seconds, elevated 133 ft., and visible 17 miles. With the light bearing between N. by W. $\frac{1}{4}$ W. and S.E. by S. $\frac{1}{2}$ S. a vessel southward of Columbia River entrance will be clear of danger. A *Fog Siren*, on the West side of the lighthouse, will sound a blast of 5 seconds, at intervals of $1\frac{1}{2}$ minute, in thick and foggy weather.

This cape is a good landmark for making the mouth of Columbia River, no such high headland occurring on the coast northward of it for over 70 miles,

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and before being up with it the moderately high land of Cape Disappointment is seen, and made as two islands.

The face of the cape is much broken, and formed principally of yellow clay, presenting a bright appearance in the sunlight. Clarke says that 1,200 ft. above the ocean occurs a stratum of white earth, then (1805-6) used by the Indians as paint; and that the hill-sides slip away in masses of 50 to 100 acres at a time. Upon the top of the cape Clarke says he found good, sound, solid trees growing to a height of 210 ft., and acquiring a diameter of from 8 to 12 ft.

From Tillamook Head southward many miles was the country of the Killamuck Indians, then estimated to number 1,000 people, and having fifty houses. The coast from Point Orford to Tillamook head is well diversified by high hills and valleys, presenting a country well watered by numerous small streams emptying into the ocean. It is densely covered with various woods, and for a few miles inland looks favourably from the deck of a vessel. Some distance in the interior ranges of mountains occur, the general direction of which appears to be parallel with the coast-line, which attains its greatest elevation and compactness between Cape Falcon and Tillamook Head, after which a sudden and marked change takes place, and a stretch of low sandy coast commences, and runs for nearly 100 miles northward, only broken by Cape Disappointment.

At 2 miles northward of Tillamook Head commences a peculiar line of low sandy ridges, running parallel to the beach towards Point Adams, and appearing like huge sand-waves covered with grass and fern. Between some of them run small creeks, whilst the country behind is low, swampy, and covered with wood, and an almost impenetrable undergrowth. About 3 miles North of the head, Clarke says a beautiful stream empties, with a strong rapid current. It is 85 yards wide, and has 3 ft. at its shallowest crossing, and is now known as Nekanekum Creek. The coast is fronted by shallow water.

Vessels approaching Columbia River from the southward can pass with safety half a mile West of Tillamook Rock, and should then keep seaward of the line joining the light on the rock and that on Cape Disappointment.

COLUMBIA RIVER.

This river is by far the most considerable of any that enter the sea on this side of the Pacific. The river, with its valley, is the most interesting and important part of Oregon, not only on account of the variety of soil, productions, and climate, but also from its being a valuable line of communication between the sea-coast and the interior, now supplemented by the construction of the Northern Pacific and other railways.

Columbia River rises in British Columbia on the western slope of the Rocky Mountains, near lat. 50° N., long. 116° W., and enters the ocean after a course

North Pacific.

of about 1,400 miles. Its navigation is interrupted by several rapids, which divide it into four sections. From its mouth to Vancouver, a distance of 114 miles, it is navigable for vessels which can cross the bar; during its lowest stages vessels not drawing over 12 ft. water can ascend about 45 miles farther, to the Cascades. The tides rise and fall above Vancouver, but they cause no change of current beyond Oak Point; during the freshets the Columbia rises at Vancouver 19 ft. above the low-water mark.

The valley of the Columbia, as high as the Cascades, is divided into high and low prairies; the latter are not suitable for cultivation, on account of being overflowed by the annual freshets, but they are admirably adapted for grazing-lands. The soil of the upper or higher prairie is light and gravelly; it is well covered with pines, arbutus, oaks, ash, and maples; and the hills which border it are generally volcanic.

For Sailing Vessels, without the aid of a steam-tug, the entrance to the Columbia is impracticable for two-thirds of the year. It could not be safely entered at night, and in the day only at particular times of the tide and direction of the wind. Unlike all known ports, it would require both the tide and wind to be contrary to ensure any degree of safety.

Before the introduction of steam, vessels frequently had to lie for several weeks in Baker Bay, inside the entrance, during the winter, for fine weather to get out, for which a fair wind and smooth water are indispensable. The difficulties of ingress were also greater, inasmuch as a vessel in the open ocean could not watch her opportunity so conveniently as when at anchor in Baker Bay; and the hazard would be still greater were it not that the openness of the coasts, and the prevalent gales, lessen the hazard of a lee-shore.

One feature which renders it still more difficult for a sailing vessel to cross the bar is, that a good and commanding breeze within or without the mouth often falls to a calm when the breakers are reached. The shifting of the shoals forming the bars and entrances, which they do apparently very considerably at short intervals, increases the difficulty, from the impossibility of having any established marks for the guidance of the commander, which will be good for a lengthened period.

In addition to this, the cross-tides, and their great velocity, increase the difficulties. The heavy swell of the Pacific, and the influence of an under current, add their embarrassments, and all these become greater from the distance of the leading marks of the channel, and their indistinctness when the weather will permit entrance. It is necessary to use them, because the compass bearings are of little or no use. The land near it is well marked, and this is some little advantage.

"But these obstructions, in proportion as they lessen the value of the river, enhanced at the same time the merit of the man who first surmounted them—a merit which cannot be denied to the judgment, perseverance, and courage of Capt. Gray, of Boston. Whether or not Capt. Gray's achievement is

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entitled to rank as a discovery, the question is one which a bare sense of justice, without regard to political consequences, requires to be decided by facts alone. First, in 1775, Heceta, a Spaniard, discovered the opening between Cape Disappointment on the North, and Point Adams on the South, —a discovery the more worthy of notice, inasmuch as such an opening can hardly be observed excepting when approached from the westward; and being induced, partly by the appearance of the land, and partly by native traditions as to a great river of the West, he filled the gap by a guess with his Rio de San Roque. Secondly, in 1788, Meares, an Englishman, sailing under Portuguese colours, approached the opening in question into 7 fathoms water, but pronounced the Rio de San Roque to be a fable, being neither able to enter it nor discover any symptoms of its existence. Thirdly, Gray, though after an effort of nine days he failed to effect an entrance, was yet convinced of the existence of a great river by the colour and current of the water. Fourthly, in April, 1792, Vancouver, while he fell short of Gray's conviction, then unknown to him, correctly decided that the river, if it existed, was a very intricate one, and not a safe navigable harbour for vessels of the burden of his ship. Fifthly, in May, 1792, Gray, returning expressly to complete his discovery of the previous year, entered the river, finding the channel very narrow, and not navigable more than 15 miles upwards, even for his *Columbia*, of 220 tons. According to this summary statement of incontrovertible facts, the inquiry resolves itself into three points—the discovery of the opening by Heceta, the discovery of the river by Gray on his first visit, and the discovery of a practicable entrance by the same individual revisiting the spot for the avowed purpose of confirming and maintaining his previous belief. Gray thus discovered *one* point in a country, which, as a whole, other nations had discovered, so that the pretensions of America had been already forestalled by Spain and England."—*Sir George Simpson*.

The entrance of the river is now, however, rendered as safe as that of most other barred harbours, by the establishment of powerful steam-tugs, and a pilot station. On account of the shifting channels, *no vessel should cross the bar without a pilot on board*. No vessel drawing over 20½ ft. should attempt to cross the bar, except between May 1st and October 1st, when it is generally smooth. In bad weather the sea breaks across the entrance from shore to shore.

Vessels drawing 24 ft. have safely crossed the bar at high tide in calm weather, but a vessel should not draw much over 20 ft. if she wishes to avoid possible loss of time in waiting for a smooth bar. It is proposed to improve the entrance by carrying out a jetty from Adams Point, over Clatsop Spit.

An entrance should not be attempted without a tug, if the entrance is not well defined by breakers. The best time for a sailing vessel to enter and depart is after ebb and before quarter-flood, as the tide then runs direct

through the channels, and a good breeze is necessary. In foggy weather attention should be paid to the lead, and the land should be made South of the bar.

Pilots.—The pilot station is at Astoria, and vessels arriving off the bar are telegraphed from the lighthouse on Cape Disappointment to the station, when a pilot is sent out with a steam-tug. The bar pilot will conduct the vessel as far as Astoria or Tongue Point, when a river-pilot must be taken on board, if ascending to Portland, &c.

We now proceed to give a general description of the river, but directions for entering it would be worse than useless owing to their inevitable uncertainty. The shipmaster, therefore, who would enter unassisted by a proper pilot, must be quite prepared to exhaust all a seaman's energies in the formidable undertaking. And he will the more readily comprehend the necessity of this, when it is said that, previously to the establishment of the pilot service, nearly every vessel whose visit is recorded gives an account of her grounding on some part of the passage; and the *Peacock*, one of the United States' Exploring Expedition, was totally lost on the terrible bar.

The first complete survey that was made of the river was that by Sir Edward Belcher, in H.M.S. *Sulphur*, in 1839, which showed some remarkable changes from the charts of 1792. The northern channel up to Cape Disappointment was then the only known good entrance. The U.S. Exploring Expedition, in 1841, also examined it, and found but one channel, but that was little changed. The next advance in its hydrography was the discovery of the South channel, in January or February, 1850, by Capt. White, who found not less than 4 fathoms on the bar. In 1851 the U.S. Coast Survey officers under Lieut. W. P. McArthur, completed a preliminary survey of the outer entrance, and in 1869 a survey was made by Mr. E. Cordell, U.S. Coast Survey, which showed that the North channel had very much altered and was unsafe, except for small vessels. To these and later authorities, including the examination by Lieut. Price, in 1882, and to the directions drawn up by Mr. George Davidson, combined with our former observations, we owe the following remarks:—

POINT ADAMS, the South point of the entrance, is low and sandy, covered with bushes and trees to the line of sand beach and low dunes; and although it is reported to have washed away over half a mile since 1841, the surveyors found comparatively small changes since the survey of Broughton in 1792. On the eastern side of the point is *Fort Stevens*.

The **LIGHTHOUSE** on Point Adams is a square tower, rising from the keeper's dwelling, 49 ft. high, and painted a light buff colour. It stands on a low ridge on the western side of the point, and shows a *fixed red* light, elevated 99 ft., and visible 15 miles.

The beach around Point Adams, and to the southward some distance, is

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usually called *Clatsop Beach*.* On Point Adams some missionaries were established in 1841, near the Indian village. Capt. Wilkes visited these pioneers in the wilderness. In walking on the sand-hills, and about Point Adams, he says that he had never in all his life seen so many snakes as were on the beach, where they were apparently feeding at low water.

CAPE DISAPPOINTMENT.†—The North side of the Columbia River forms part of Washington Territory; it was the southern boundary of the "New Georgia" of Vancouver, 1792.

This cape is the only headland from Tillamook to lat. $47^{\circ} 20'$ that breaks the low line of shore. It presents a geological formation not before met with on the sea-board, being composed of horizontal columnar basalt, rising to an elevation of 287 ft., disposed in a succession of huge round hills, broken on the sea front by short strips of sand beach, and covering an irregular area of about 3 miles by one. Inland of their crests the trees commence, and their tops reaching above the summits of the hills increase their apparent height. The inshore slope of the hills is more gentle, so that paths can be easily carried to their tops.

As seen from the southward, when off Tillamook Head, Cape Disappointment is made as two round-topped islands. Approached from the N.W., it rises in a similar manner; from the West and S.W. it appears projected upon the mountains, but the slightest haziness in the atmosphere brings it out in sharp relief. A *lifeboat* is stationed just within the cape.

The **LIGHTHOUSE** is not upon the top of the cape, but upon a spur a little to the West of the S.E. point, known as *Hancock Point*, and about 95 ft. below the highest part. The tower is whitewashed, placed 192 ft. above the level of the sea, and being 40 ft. in height, and projected against a dark green background, shows well by day. The light is *fixed bright*, elevated 232 ft. above the sea, and visible about 22 miles. The *Fog Bell*, formerly sounded here, was discontinued in September, 1881. The lighthouse is in lat. $46^{\circ} 16' 32''$ N., long. $124^{\circ} 3' 11''$ W.

During the early part of the evening dense fogs, formed over the waters of Gray and Shoalwater Bays, are brought southward by the summer winds, and roll over Cape Disappointment, which they completely shut in before reaching across the river, so that a vessel might make the light on Point Adams, when

* Upon Clatsop Beach, before the whites occupied the country, a Chinese or Japanese junk, with many hands, and a cargo of beeswax, was cast ashore, and went to pieces, but the crew were saved. In support of this Indian tradition, occasionally, after great storms, pieces of this wax are thrown ashore, coated with sand, and bleached nearly white. Formerly a great deal was found, but now it is rarely met with.

† This cape was seen by De Hecota, in August, 1776, and again by Capt. Meares, in July, 1788, when he called it *Cape Disappointment*, by which name it is still known. In 1792, Gray, the real discoverer of the river, called it *Cape Hancock* afterward, but relinquished this term. It is still, however, applied to it in some works. The Indian name is *Exh-ere*.

that on the other cape was invisible; but by seeing both lights a vessel could hold any required position at night near either bar, and run in and take a pilot upon the first opportunity; for it would be assuming too great a risk to enter the river at night without a pilot.

When the evening fogs, from the northern bays, do not cover the cape, a dense fog is sometimes experienced rolling down the river about sunrise, enveloping everything below the top of the cape. The evening fogs are, however, very regular.

The Entrance to Columbia River is 5 miles wide between the nearest parts of Cape Disappointment and Point Adams, bearing N.W. by W. $\frac{1}{4}$ W. and S.E. by E. $\frac{1}{4}$ E. from each other; but the passage is greatly obstructed by extensive shifting shoals, which extend in a curve, between the two points, and nearly 4 miles seaward of the line joining the points. The numerous surveys that have been made of this river prove so conclusively the great changes which the channels through the shoals undergo, that the subsequent remarks on the North and South channels must be used with great caution. The best advice we can offer is, when up with the bar, *wait for a pilot*. The buoys, hereafter described, and the range beacons for leading in, erected at the East end of Sand Island, are shifted to correspond with the changes.

The mail and coasting steamers used to enter the South channel parallel and close to the beach South of Point Adams; but with a heavy swell from the westward they roll very much after rounding the point. In heavy weather some of them preferred entering the North channel, although it gives a detour of some miles. In February, 1883, it was announced that the North channel had been gradually shoaling to a depth of 17 feet.

Sailing vessels cannot beat into the South channel against the summer winds blowing from the N.W., but almost invariably come out through it. The heavily laden vessels of the Hudson's Bay Company have always used the North channel.

During heavy weather, and especially in winter, the sea breaks with terrific fury from N.W. of Cape Disappointment well to the southward of Point Adams, and the mail steamer was once trying for 60 hours to find the smallest show of an opening to get in. Sailing vessels have laid off the entrance six weeks, waiting for a fair opportunity to enter, and many have laid inside for weeks trying to get out. The mail steamer meanwhile, exerting all her power, would drive through the combers, having her deck swept fore and aft by every sea. Few places present a scene of more wildness than this bar during a S.E. gale, contrasting strongly with many times during the summer, when not a breaker is seen to mark the outline of the shoalest spot. In bad weather the pilot boats cannot venture out, but a steamer might; and the mail steamers, to avoid delay, now regularly carry a bar pilot with them.*

* An evidence of the danger of the entrance was afforded by the wreck of the *Barque*

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During the season of freshets, about June, the pilots say that the river brings down such a vast body of water, that they can frequently take up for use fresh water upon the bar.

When off the entrance in fine clear weather, the beautiful snowy peak of *Mount St. Helen's* shows over the lowest part of the land inside, and apparently in the middle of the river valley. It is very regular in outline, and presents a pyramidal appearance, having a base equal to either side. It is over 75 miles eastward from the entrance to the river, and attains an elevation of 9,750 ft. It is volcanic, and occasionally discharges volumes of smoke.*

The southernmost channel, which passes between the S.E. end of the outer Middle Sand and the bank abutting on Point Adams, had nowhere less than 24 ft. water at any time of tide, and was once the only practicable entrance, but it has now shoaled, and the greatest depth in its northern part, where it is much blocked by patches of less than 3 fathoms, is 21 ft. (1883). The *Middle Bank* is extensive, and stretches for $4\frac{1}{2}$ miles southward of Cape Disappointment, its eastern edge being $2\frac{1}{2}$ miles off from the low land of Point Adams, leaving a channel about three-quarters of a mile wide between it and the bank against the latter point.

A large buoy, striped white and black, lies in about 10 fathoms, off the entrance of this channel, with the whistle buoy bearing W. by N. $\frac{1}{2}$ N., distant $2\frac{1}{2}$ miles, Cape Disappointment lighthouse bearing N. by W. $\frac{1}{2}$ W., and Point Adams lighthouse N.E. $\frac{1}{2}$ E., the latter distant about $3\frac{1}{2}$ miles. At a little over $1\frac{1}{2}$ mile N. $\frac{1}{2}$ E. of this buoy, is a black one, on the S.E. end of the Middle Bank, at $2\frac{1}{2}$ miles W. by S. $\frac{1}{2}$ S. from Point Adams lighthouse.

South Channel.—In 1883 it was found that a new and straight channel had broken out across the central part of the Middle Bank; it has a depth of 20 ft. at mean low water, is now buoyed, and is used by all loaded vessels. The automatic *Whistle buoy* (which had previously been removed to a position off the North channel entrance), is now moored off the entrance to the South channel, South of the Middle Sands, in about 12 fathoms, with Cape Disappointment lighthouse bearing N. $\frac{1}{2}$ E., distant 5 miles, and Point Adams lighthouse, E. by N. $\frac{1}{2}$ N., $5\frac{1}{2}$ miles. Other buoys are moored on the inner side of the bar.

The following directions for entering this new channel were issued by the Lighthouse Inspector in March, 1883, and are given here, subject to the remarks on pp. 299, 300, &c. :—

Bring Cape Disappointment lighthouse N. $\frac{1}{2}$ E. and steer for it. When

Oricle, which sank in the endeavour to enter, on September 19th, 1853. The vessel and cargo were totally lost, but the crew saved. She had on board the materials for the lighthouse, since erected on Cape Disappointment.

* On November 23rd, 1842, during an eruption, the ashes fell from it over the Falls of the Columbia like a fall of snow. Mounts St. Helen's and Rainier were both in action, on November 13th, 1843.

Point Adams lighthouse bears E. by N. $\frac{1}{4}$ N., you should be up with the whistling buoy; from it steer N.N.E., which carries you past the inner bar buoy, also Nos. 1 and 3 on the Middle Sands, leaving the black buoys on the port hand. After passing No. 3, change course to N. by E., leaving the red buoy No. 2, Clatsop Spit, on the starboard hand; then McKenzie Head just shut in with Hancock Point, astern, leads to the black buoy off Adams Point. The entrance buoys are stated to be invariably out of position. The buoys, from the bar buoy No. 2, are placed as nearly in line as possible and nearly in the narrow channel.

The North Channel, as before stated, is now not available for large vessels. It would be useless to attempt to give directions for using it, as the constant changes would speedily render them untrustworthy.

The outer *black* and *white striped* buoy, off the entrance to the North channel, is moored in about 10 fathoms, with Cape Disappointment lighthouse bearing N.E. $\frac{3}{4}$ E., distant $3\frac{1}{4}$ miles, and the whistle buoy S.E. by S., $3\frac{3}{4}$ miles. At a little over a mile to N.E. a similar buoy is moored on the bar in $3\frac{1}{2}$ fathoms, and on a line E. by S. from this, within a distance of about 2 miles, were three other buoys, the first *black* and *white striped*, the second *red*, and the third *black*, the latter being situated at the junction of the North channel with the main channel of the river. At $3\frac{1}{4}$ cables N.E. of the red buoy a *black* buoy was moored off the South end of the flat extending nearly $1\frac{1}{2}$ mile southward of Cape Disappointment lighthouse. At half a mile to N.E. by N. of the latter buoy was another *black* buoy, on the West side of the channel leading to Baker Bay.

BAKER BAY, to the eastward of Cape Disappointment, was so named by Broughton. There is good anchorage in it under the cape, to the E.N.E. of which four buoys were moored, marking the deeper water of 4 to 6 fathoms, and the northern entrance of the channel between Sand Island and Chinook Spit, having $2\frac{1}{4}$ to $2\frac{3}{4}$ fathoms water in it, leading to the main channel of the river; a *black* and *white* buoy is moored at the eastern entrance of this channel. Baker Bay runs $2\frac{1}{2}$ miles northward of the cape, and into its head run some small streams, coming from the direction of Shoalwater Bay, with which they are connected by a small portage. A survey, made in 1881, demonstrated the practicability of constructing a canal between these bays, for vessels of light draught. Two or three houses and a saw-mill, a mile northward of the cape, are all that remains of the settlement designated as "Pacific City." The greater part of the bay is occupied by shoal water, Sand Island and Chinook Spit lying on its S.E. side.

Ranges cannot be given for the channel from Baker Bay to Sand Island, owing to the constant changes and the influence the current exerts at different stages of the tide. The cross tides in the North Channel, and the baffling wind near Cape bluff, make this channel very difficult for sailing vessels. The prevailing wind is N.W. by W., and in the narrowest part of the channel vessels must generally beat in a cross tide.

Chinook Point, the eastern limit of Baker Bay, is N.N.E. 3 miles from the fort on Point Adams, and $4\frac{1}{2}$ miles E. $\frac{1}{2}$ N. from Cape Disappointment. It is a low strip of sand at the base of high wooded hills, one of which, called *Scarborough Hill*, is remarkable for a great part of its southern slope being bare of trees. There is no good anchorage near this point, as a heavy sea sometimes sets in on it over the bar.

There are many fishing and Indian huts on Chinook Beach, occupied by salmon fishers. The fish commence running up about the end of May, and are remarkably plentiful by the end of June.

Point Ellis, or *Ellice*, is $1\frac{1}{2}$ mile E. by N. of Chinook Point. Behind it rise two peaked hills, one of which is (or was) used with Point Adams, as a leading mark for the southern bar. At 5 miles N.E. of Ellice Point is *Portuguese, Broughton*, or *Gray Point*, on the western side of *Gray Bay*, into which falls the Alamicut River.

Sand Island, before alluded to, is a dry spot on the eastern extension of the Middle Bank. This bank is formed by the trees and timber which have floated down the river, and which become lodged here, forming a nucleus, around which the debris brought down by the stream increases. The island is about $1\frac{1}{2}$ mile long E.S.E. and W.N.W., curving to the south-westward of this line, and from half a cable to $2\frac{1}{2}$ cables in width. On its southern side are two beacons, used as marks for the South channel over the bar.

Clatsop Channel, which passes in an easterly direction around Point Adams and Clatsop Beach, is about two-thirds of a mile wide between Sand Island and *Clatsop Spit*, which stretches off for $2\frac{1}{2}$ miles W.N.W. of Point Adams, having at its outer edge not more than $7\frac{1}{2}$ ft. water, off which a red buoy is moored. The channel is from 6 to 12 fathoms deep at the bend.

Clatsop Channel further up is bounded on the North side by the Middle Ground off Young Bay. The West end of this Middle Ground is marked by a black buoy, lying in about 4 fathoms, with the fort on Point Adams bearing S. $\frac{1}{2}$ E., distant three-quarters of a mile.

The southern side of this bank is marked by three more black buoys, the third marking the North side of the channel abreast Astoria. The tide sets fairly through the channel from Astoria to Sand Island.

At about $4\frac{1}{2}$ miles East of the fort on Point Adams is *Point George, Young*, or *Smith*, forming the East limit of *Young Bay*. It is the first point made after passing eastward of Clatsop Beach; immediately behind it the land is high and densely wooded. The entrance of *Young River*, so named by Vancouver after Sir George Young, lies to the southward of the point. From its banks a low meadow, interspersed with scattered trees and shrubs, extends to the more elevated land. From a sort of bar across its entrance it is not easily navigable, though the depth is above $2\frac{1}{2}$ fathoms. *Lewis and Clark Rivers*, and several other small streams, also empty themselves into Young Bay.

North Pacific.

Astor Point lies E. $\frac{1}{2}$ N., $5\frac{1}{4}$ miles from Point Adams. It is low at the river bank; the southern channel passes close to it. The United States Coast Survey Station, about one quarter of a mile westward of the bay, is in lat. $46^{\circ} 11' 27.6''$ N., long. $123^{\circ} 50' 5''$ W.

ASTORIA, which lies to the eastward of Point George, on the southern shore of the river, has been much celebrated; but its early fame depends mainly upon its historian, that delightful writer, Washington Irving, who has told all the world of its former progress and fortunes. Its original appellation was superseded for that of *Fort George*, when it was taken possession of by the British.* The peninsula upon which Astoria stands forms a bay with Young River, where the intrepid travellers, Lewis and Clark, wintered.

Of late years Astoria has risen into prominence by the development of the wheat and timber export trade, and as the head-quarters of the salmon-packing industry; the total pack of Columbia River salmon, in 1883, amounting to about 650,000 cases of 48 lbs. each, or nearly two-thirds of the whole pack of the North Pacific coast. The greater number of the canneries are in the town itself, and these, with the saw-mills, give employment to the greater part of the inhabitants, who number about 7,000. British vessels carry on the greater part of the trade; the imports consist principally of tin-plates and coal. Vessels drawing 22 ft. can load alongside. There is good anchorage in 6 fathoms, 2 cables off the wharves, with the town bearing South.

Mr. Cherry, the consular agent, in 1884, stated that efforts are being made to connect the port with the interior by a railway, which would pass through a country known to possess coal-beds of considerable extent, to the fertile Willamette valley. It also offers good sites for dry docks, &c.

Astoria is very beautifully situated. It is 10 miles from Cape Disappointment in a direct line, and from it there is a fine view of that high promontory and the ocean bounding it on the West; the Chinook Hills and Point Ellice, with its rugged peak, on the North; Tongue Point and Katalamet Range on the East; and a high background, bristling with lofty pines, to the South. The ground rises from the river gradually to the top of a ridge, 500 ft. in elevation. A government military road leads to Salem, &c., on the Willamette, and at *Upper Astoria*, a village three-quarters of a mile to the eastward, is a landing-pier.

At $2\frac{1}{4}$ miles N.E. $\frac{1}{2}$ N. of Upper Astoria, and $3\frac{1}{2}$ miles S.S.E. of Portuguese Point, is a remarkable projection from the southern shore, called *Tongue Point*,

* In 1809 Mr. John Jacob Astor, a German, who had emigrated from his native country in 1783, engaged in the fur trade, and in that year obtained a charter from the New York legislature for organizing a Pacific Fur Company, all the capital of which belonged to himself. His plan was to establish posts on the coast of the Pacific, on the Columbia, &c., &c. For the execution of this project, two expeditions were sent out, one by sea and one by land. In September, 1810, the ship *Tonquin* left New York, and in March, 1811, founded the post of Astoria.

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forming a peninsula; and to the North of this point is a channel, which Capt. Belcher designated the *Tongue Channel*. This leads over to the northern shore, and then turns to the eastward on the northern side. *Woody Island Channel* trends away north-eastward of the point.

Tongue Point is considered to be the best position for a fortification to defend the channel up the river. It is a high bluff trap rock, covered with trees of large dimensions. There is a small portage on Tongue Point, which canoes often use in bad weather, to avoid accidents that might occur in the rough seas in the channel that passes round it.

The space, whose shores are thus imperfectly described, is from 3 to 7 miles wide, and very intricate to navigate, on account of the shoals which nearly occupy its whole extent. These shift very materially, and that, too, in very short periods of time, so that no established directions can here be given.

Tides.—It is high water at Astoria, on full and change, at 12^h 42^m; springs rise 7½ ft., neaps 4½ ft. At Cape Disappointment it is high water at 12^h 20^m. The tides in this river are subject to a large diurnal inequality, which may either accelerate or retard the time of high water, sometimes as much as 1 to 1½ hour, and increase or diminish the rise by 2 or 3 feet.

Off Sandy Island, in the South channel, the strength of the ebb current was measured in 1851, and found to be nearly 5½ miles per hour. The observations of the Coast Survey in 1868, however, show a maximum velocity of only 3·4 miles in the same position. These observations were carefully made, and show the direction and velocity of the current during each quarter of the ebb and flood, from the bar to Astoria.

These observations show, first, that there is no slack water at the change of tides from flood to ebb; secondly, that off the entrance to the North channel the maximum velocity of the flood is 2 miles per hour, and the set E.S.E.; the maximum velocity of the ebb is 2·3 miles, and the set S.W. by S. ½ S., almost exactly in the direction of the axis of the channel. In the North channel, between the Middle Sands and the S.W. point of the North breakers, the velocity of the flood was 2·5 miles, and its set E. by S., or nearly across the channel. The velocity of the ebb was 2·7 miles, and its set S.W. ½ W., directly down the channel. Off Cape Disappointment, between it and Sulphur Spit (where Belcher grounded), the under-current of the flood set N. by E.; and the surface ebb set S.W. ½ S. with a velocity of 3·1 miles. About a mile to the eastward, however, with Cape Disappointment lighthouse bearing W.S.W., the velocity of the ebb increases to 4·4 miles per hour, setting W. by S., exactly toward Cape Disappointment. There is here very little flood current. At the junction of the North and South channels, 1 mile East of Sand Island, the flood was E. by S. ½ S., 1½ mile per hour; and the ebb, W. ½ N., 4 miles per hour.

Off the South channel entrance, 1½ mile S.E. of the South end of the Middle Sands, the ebb attains a velocity of 2 miles per hour, with a set at its

maximum, S. $\frac{1}{2}$ W. The flood sets E.S.E., when it attains its greatest velocity, which is 1.3 mile. Off the N.W. end of Clatsop Spit, the flood, at its maximum, sets E. by N. $\frac{1}{2}$ N., at the rate of 1.4 mile; and the ebb S.W. $\frac{1}{2}$ W., 3 miles per hour. In mid-channel, S.E. of the eastern end of Sand Island, the ebb attains a velocity of 3.4 miles, and sets W. by S.; while the flood at its maximum sets E. $\frac{1}{2}$ N., with a velocity of 1.9 mile. This is very nearly the same position where, in 1851, the velocity was found to be nearly $5\frac{1}{2}$ miles.

The **COLUMBIA RIVER**, above the broader portion of its course, may be briefly described. At night *lights* are shown at various places on the banks, for the pilots' use. From Tongue Point it continues towards the N.E., the southern side consisting of low and marshy islands; but, after advancing about 10 miles, the land becomes high and rocky on both sides, the river turning from a N.E. to an E.S.E. direction, at *Katalamet* or *Cathlamet Point*.

At about $3\frac{1}{2}$ miles above this point is the western point of *Puget Island*, well wooded, and about $3\frac{1}{2}$ miles in length, dividing the stream into two branches, and affording a passage on either of it. It continues in the same direction about 5 miles farther, when it takes a turn to the N.E. for about 3 miles to *Oak Point* on the South shore, where the river turns nearly at right angles, taking its course along a barrier of trap rocks on the West side, and which rises 800 ft. perpendicularly above its surface. On the opposite side of the river is one of the remarkable prairies of the country, covered with tall waving grass, and studded with many oaks, from which the point takes its name. What adds additional interest and beauty to the scene is Mount St. Helen's, about 40 miles off in the eastern quarter.

From Oak Point to *Walker Island* the distance is about 4 miles; it is small and wooded, and was named by Vancouver after his surgeon. At 4 miles above Walker Island is the mouth of Cowlitz River, entering the Columbia on the North shore, with the town of *Monticello* a short distance up it.

Cowlitz River.—From Cape Disappointment to the mouth of Cowlitz River the bearing and distance are E. $\frac{3}{4}$ N., 48 miles, in a straight line; but along the course of the river the distance is considerably more. The Cowlitz runs N.N.W. for 24 miles; thence N.E. to its head-waters in the Cascades. It is navigated by canoes about 28 miles to the Cowlitz landing, where, before the construction of the railway, travellers took mules or horses through to Puget's Sound, a trip of 52 miles. Small steamers can ascend the river nearly 40 miles.

Mount Coffin, a conical hill on the North shore, $2\frac{1}{2}$ miles westward of the mouth of the Cowlitz, is 240 ft. high, and is so named from having been the burying-place of the Indians. On the opposite side of the river is a high barrier of trap rocks covered with majestic pines. *Coffin Rock*, about 7 miles above Mount Coffin, is of small dimensions, and has been the burial-place of chiefs, who are usually interred in canoes, which are provided with all the necessary appendages to the land of spirits and their hunting grounds.

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Opposite the entrance of Cowlitz River is the town or village of *Rainier*. At 4 miles beyond the Cowlitz, and on the North bank of the river, is *Kalama*, the terminus of the railway from Olympia, on Puget Sound, Tacoma, Seattle, &c., and from hence steamers ply to Portland.

From the mouth of the Cowlitz, the Columbia runs about 15 miles S.E. by S. to *Warrior Point*, where the river separates into two branches, that to the westward, called the *Warrior Branch*, forming with the Columbia, the large Island of *Multnomah*, or *Wappatoo*, connected with Willamette River.

Willamette River.—The entrance of Willamette River is about 26 miles S.E. by S. from the Cowlitz. The Willamette continues the same general course of the Columbia for 16 miles to the falls, where is situated the town of *Oregon City*, having about 2,000 inhabitants, destined to become a place of importance, on account of the extensive water-power, the river falling there perpendicularly 38 to 40 ft. There is a system of locks here, to enable vessels to reach the upper part of the river. The fertile valley of the Willamette, through which railways pass to the southward, is well settled, and contains several thriving towns. On the lower part of the Columbia and Willamette many saw-mills have been erected, and a large trade is carried on in lumber.

PORTLAND.—At 6 miles below Oregon City, is the rapidly-improving city of Portland, situated at the head of ship navigation, and 98 miles by the river from Astoria. In 1880 its population amounted to 20,814, and according to a careful estimate made at the close of 1883, it had increased to about 46,000. In 1883 the Northern Pacific Railway was completed, thus connecting Portland with the eastern States, and the Oregon and California Railway was expected to join up, at the end of 1884, with the line coming northward from Sacramento, thus giving direct railway communication with San Francisco, &c. Another line will connect with the line going northward from Kalama to Puget Sound. At present there is regular communication by steamer with San Francisco, British Columbia, Puget Sound, Alaska, &c., and a large fleet of stern-wheel steamers ply on the Columbia and Willamette Rivers. On the latter river the steamers ascend as far as *Eugene City*, 138 miles above Portland, when the water is high, and to *Salem*, the capital of the State, 51 miles from Portland, all the year round.

A dry dock is being constructed at Portland by the Oregon Railway Company; it will be 400 ft. long, with an entrance 72 ft. wide, having 18 ft. water over the sill at the lowest tides. New wharfs are also being constructed at *Albina*, on the East side of the river, opposite Portland.

A large export trade is carried on at Portland in wheat, flour, wool, hides, lumber, &c. The total value of the exports from Portland and Astoria, in 1883, exclusive of the coasting trade, amounted to £1,328,903, of which Great Britain took £1,227,717. In 1883, 81 vessels, with a total tonnage of

79,673, entered the Columbia from foreign ports, of which 74, with a tonnage of 72,696, were British.

Between Portland and the entrance of Willamette River, the river is obstructed by four bars, through which channels are being dredged to a depth of 20 ft. In June, 1883, a least depth of 17 to 18 ft. at low water had been attained. Mr. Laidlaw, Vice-Consul, states that the completion of these improvements will do away with the expensive lighterage now necessary at low stage of water in the river (October to December). There are two *red leading lights* at the entrance, near the town of *St. Helen*.

At 5 miles above the Willamette, and on the North bank of Columbia River, is the town and fort of *Vancouver*, formerly a settlement of the Hudson's Bay Company. At 45 miles above this the foot of the Cascades is reached. The *Cascades* are a series of rapids, 4 miles long, where the river bursts through the eastern part of the Cascade Mountains, the basaltic walls of which rise precipitously over 3,000 ft. on either side, presenting a magnificent sight. At present steamers ply between Portland and the foot of the rapids, whence passengers are conveyed by a tramway to the head, where steamers are ready to convey them to the *Dalles*, a distance of 50 miles; here the river becomes contracted between narrow perpendicular walls, and rises 100 ft. above its ordinary level during freshets. From Dalles a railway runs 14 miles to Celilo, when the river again becomes navigable for 185 miles to Priest's Rapids. Above this it is navigable for about 250 miles from Fort Colville.* The railway now passes along the southern side of the river.

"A canal and locks are being constructed around the Cascades. The object is to improve the river at the minor rapids and give lockage around the principal rapids of the Cascades, for stages of 20 ft. of water at the foot of the canal, for about one-half of the year, which includes the busy boating season. The plan is arranged for any extension for higher stages of the river. The canal will be about 3,000 ft. long. The low-water lock will have a lift of about 24 ft., and the lock capacity will be 90 by 462 ft., with a least draught of 8 ft."—*Mr. Vice-Consul Laidlaw, 1884.*

The snow peaks of the volcanic Mount St. Helen's and Mount Hood lie exactly in line with the Cascades, the former N.W. $\frac{1}{4}$ N., 35 miles distant; the latter S.E. $\frac{1}{4}$ S., 28 miles distant. *Mount Hood* is an extinct volcano, 11,225 ft. high, covered with cellular lava.

* Much information concerning the upper part of Columbia River will be found in a "Report of an Examination of the Upper Columbia River, and the Territory in its Vicinity," by Lieut. Thomas W. Symons, U.S. Army, published at Washington, 1882. The volume is illustrated with numerous maps.

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WASHINGTON TERRITORY.

Columbia River divides Oregon from Washington Territory, which extends between the parallels of 46° and 49° eastward to the Rocky Mountains, and has an area of about 69,180 square miles. The population in 1880 was 75,120; in 1870 it was 23,955. Large quantities of timber are cut and exported, and the canning of salmon, in which the rivers abound, is largely carried on. Coal is found in several parts, as noticed hereafter; the total production in 1882 was over 200,000 tons. That portion of the western section of Washington Territory which lies between the Columbia and Puget Sound is watered by several streams, some of which flow into the Columbia on the South, others into the Pacific on the West, and others into Puget Sound on the North. These all rise in the spurs of the Cascade Range, and drain this part of the country. The land between the Cowlitz and the Chehalis, Chicaylis, or Chickees River is an extensive prairie, known as the Cammas Plains.

The country from the seaboard to the Cowlitz is covered with a dense forest of spruce, pine, and hemlock. The soil is a brown or black vegetable earth, with a substratum of clay. The patches of alluvial land bordering the Chehalis River are fertile, and of some extent, studded with white oaks, and would yield good crops of wheat; they are excellent sites for farms, having an abundance of fine water, and but a short distance from water communication.

The country in the neighbourhood of Puget Sound presents an inviting aspect, and, with the exception of some bluffs, is undulating, and covered with trees of the species spoken of above. The soil of this forest-land is a thin brown stratum of sandy vegetable earth, the subsoil of clay and gravel; the latter having the appearance of being water-worn. These are succeeded by the tract of prairie lands in the vicinity of Nisqually, which are valuable as pasture lands for flocks of sheep and dairy cows. These prairies have a very extensive range in a S.E. direction, and connect with the valley of the Cowlitz on the South towards the Cascade Mountains, intersected by strips of forest. Within this district are numerous ponds or lakes, surrounded by rich meadow land, furnishing luxuriant crops of nourishing herbage. No part of Oregon and Washington Territory is better adapted for dairy purposes than this; and wheat, rye, barley, oats, &c., come to perfection.

The peninsula of Cape Flattery, North of the Chehalis, between Puget Sound and the Pacific, is rough and mountainous, and covered with a dense forest. The principal trees are hemlock, spruce, and arbor vitæ. The high ridges which jut in all directions from Mount Olympus leave but little space for tillage, except along the western side of Hood's Canal.

The Coast between Cape Disappointment and Cape Flattery is generally rocky, much broken, and affords no harbours except for very small vessels. It

must, therefore, be considered as extremely dangerous, particularly on account of the off-lying rocks in the northern part. Safety, however, can always be insured by not approaching the land into less than 70 fathoms.

SHOALWATER BAY.—The bold cliffs of Cape Disappointment, after extending about 3 miles northward, change suddenly to a low, broad, sandy beach, running N. by W. $\frac{1}{2}$ W., 18 miles, in nearly a straight line to the southern point of the entrance to Shoalwater Bay. At $1\frac{1}{2}$ mile behind this beach lies the southern arm of the bay. Its waters reach within a mile or two of the North side of the cape, and the portage from thence to the Wapalooche emptying into Baker Bay, is said to be about a mile long, and always used by the Indians and settlers. The peninsula thus formed is covered with trees and a dense undergrowth of bushes. Within half a mile of its extremity it becomes very low and sandy, and has a covering of coarse grass, but no trees. This point was called *Low Point* by Meares, in July, 1788. On the recent Coast Survey charts it is named *Leadbetter Point*. The Indian designation is Chik-lis-ilk.

CAPE SHOALWATER, or Toke Point.—From Leadbetter Point, Cape Shoalwater, the North point of Shoalwater Bay, bears N.W. by N. $\frac{3}{4}$ N., $5\frac{1}{2}$ miles. Half a mile of the cape is low, sandy, and destitute of trees, but some tolerably high land, covered with wood, rises immediately behind it, being the only elevated ground, between Cape Disappointment and Point Grenville, which approaches the shore-line. A *lifeboat* is stationed here.

It has been said the entrance of Shoalwater Bay resembles that of Columbia River, but the isolated position of Cape Disappointment and the seaward face of its bold cliffs without trees form a peculiar feature. This with *Scarborough Hill*, partly bare, lying 5 or 6 miles eastward of it, the high mountains inland, and in clear weather the beautiful snow-peak of Mount St. Helen's, have no counterparts at Cape Shoalwater, and should remove all doubt in regard to the supposed general resemblance between them.

The **LIGHTHOUSE** on Cape Shoalwater, sometimes called *Toke Point*, is a white structure, consisting of the keeper's dwelling, with a tower rising through it, 35 ft. high, about a mile from the extremity of the cape. The light is *fixed bright*, varied by *flashes* every 2 minutes, elevated 85 ft., and visible 15 miles. Lat. $46^{\circ} 43' 4''$ N., long. $124^{\circ} 4' 28''$ W.

The bay was discovered by Lieut. John Meares, July 5th, 1788, in the *Felice*, but its shoal appearance deterred him from attempting to enter it. It was surveyed in 1852 and 1855 by the U.S. survey party under Lieut. James Alden, and it then had two entrances, separated by a middle ground, on which was an island, in a similar way to the entrance of Columbia River. But in 1868 this arrangement was changed, the South channel had much filled up, and was said to be of no use, while the North channel had increased in depth to 5 fathoms, and was much wider and deeper, besides being broad and straight. The island had disappeared, and vessels sailed over its position.

As the bay is much frequented for oysters, which are exported to San Francisco, &c., it is of some importance, and is considered to be one of the best harbours on the coast North of San Francisco, being stated to be much more easy of access than Columbia River.

The directions which follow are part of those issued by Lieut. Alden, but they must be taken with the qualifications above alluded to. *No stranger should attempt to enter without a pilot.* Buoys have been placed to mark the channels, their positions being shifted when the constant changes make it necessary.

At 4 miles off the entrance to Shoalwater Bay a depth of 10 fathoms is found, and when well off shore a high double-peaked mountain shows to the eastward, well inland.

In 1855 the bar at the South channel had 4 fathoms of water upon it, was a mile wide, and was 2 miles off the beach South of Leadbetter Point, with the northernmost trees bearing N.E. by E. When inside, if the tide is low, sand-bars and flats will show on both hands; the broad deep channel to the S.E. is distinctly marked by bare patches on either side, and a narrow deep channel to the N.W. running into the North channel. The current runs very strong through this channel. In summer, with a north-wester blowing, it is a dead beat after passing the bar, and in some places the channel is less than half a mile wide between the 3-fathoms lines. Coasters do not enter it except with a southerly wind, and always pick out the channel from aloft. In summer they have a leading wind out, and start on the first of the ebb.

The bar at the North channel had about $3\frac{1}{2}$ fathoms upon it, and bore S.W. by S. $\frac{1}{2}$ S., 3 miles from the southern extremity of Cape Shoalwater, or Toke Point. It was about a mile in extent within the 3-fathoms line, and bore N.W. by N. $\frac{3}{4}$ N., 5 miles from the South bar. In making the bay from the southward in summer, work to the northward of Cape Shoalwater, then run in and follow the shore outside of the breakers in 6 or 7 fathoms, gradually approaching them, to cross the bar. If it is low water, sand-banks will show in different directions, and the channels will be tolerably well marked.

The present invariable practice of vessels entering is to steer out the channel from the mast-head. In calm weather the channels must be known, or a pilot employed, if one is to be found.

The Middle Sands lie between the two channels. The southern tail was S.W. $1\frac{1}{2}$ mile from Leadbetter Point, then ran N.W. by N. $\frac{3}{4}$ N. for $2\frac{1}{2}$ miles, then N.N.E. $2\frac{1}{2}$ miles, and E.N.E. $1\frac{1}{2}$ mile, with an average width of $1\frac{1}{2}$ mile. At a mile outside of it soundings are found in 7 fathoms.

This bay, as its name implies, is so full of shoals that at low tides about one-half of its area is laid bare. Good but narrow channels are found throughout its extent, but no directions can be given for running them. Without a knowledge of them, or without a pilot, follow them only at low water. The currents

then run with great velocity, and it is very difficult, and frequently impossible, to keep a course against them. The arm, stretching southward toward Baker Bay, is 15 miles long from Leadbetter Point, with an average width of not less than $3\frac{1}{4}$ miles, whilst the upper portion stretches to the N.E. for 9 miles to the North of the Wallahpah River, reckoning from the middle of the line joining Cape Shoalwater and Leadbetter Point.

The principal stream emptying into the bay is the *Whil-a-pah* or *Wallahpah*, at its N.E. part. At about 9 miles from Cape Shoalwater it is less than a quarter of a mile wide, with low swampy banks, and steep bluffs on each side about $1\frac{1}{2}$ mile apart.

The mouth of *Palux* or *Copalux River* lies 5 miles N.E. $\frac{1}{2}$ E. from Leadbetter Point. It is half a mile wide at its mouth, and contracts very much in 2 miles. The *Násal* enters about 11 miles South from the Palux, and abreast of the middle of Long Island. It has over 20 ft. water at its mouth, with bluff banks for some distance, until it begins to expand, when it is bordered by flats.

Several streams open from the North side of the bay. One of these, the *Necomanche*, near the Wallahpah, has 6 ft. in the main channel, and shows $1\frac{1}{2}$ mile wide at high tide.

There are three islands in the bay. *Pine Island*, about $1\frac{1}{2}$ mile N.W. by N. of the mouth of the Palux, is a small sand islet of only 4 or 5 acres in extent, occupied by oystermen. It is near the channel and oyster beds, which stretch for a couple of miles to the N.N.E. of it. The Indian name of this island is Nass-too. The North end of *Long Island* is 8 miles from Leadbetter Point. This island runs irregularly about S.E. for 6 miles, and has an average width of $1\frac{1}{2}$ mile. It is covered with a dense forest of fir and undergrowth. At a mile S.S.E. of Long Island is a very small islet called *Round Island*, of only a few acres in extent, covered with wood and bushes. The shores of the bay, except on the peninsula, are mostly composed of low perpendicular cliffs of a sandy clay, in which are strata of recent fossil shells and the remains of trees.

At 6 miles N.E. $\frac{3}{4}$ N. of Leadbetter Point, is a sharp narrow cliff, 60 ft. high, making out into the bay, which is wearing it away, and has exposed many large basaltic boulders. No other place on the bay presents this geological feature.

The peninsula is a long flat marshy and sandy plain, elevated but a few feet above the level of the sea, and covered, like the entire surface of this country, with a dense growth of gigantic forest trees, principally spruce, fir, and cedar, with a few specimens of maple, ash, and black alder. The spruce frequently attains a diameter of 8 ft. The Indian name of the peninsula is Tee-choots.

The shoals are covered with shell-fish, amongst which the *oyster* is most abundant, and the principal article of export. They are small, and have a

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coppery taste. Codfish and halibut abound; sturgeon, said to be of good quality, are plentiful; and salmon, of several varieties and excellent flavour, exist in infinite numbers. In spring, vast shoals of small herring enter the bay. In winter, wild fowl are innumerable, but these have been made shy by the bad shooting of the Indians. Black and white swan, geese, mallards, canvas-backs, &c., always reward the experienced sportsman.

It is asserted by settlers here that boats, canoes, &c., which have broken adrift and gone out of the bay, have in every instance been found on the beach North of the entrance, and generally between it and Gray Harbour.

From Cape Shoalwater to Point Hanson, the southern side of the entrance to Gray Harbour, the distance is $13\frac{1}{2}$ miles, and the hard ocean sand beach furnishes an excellent road that can be travelled at half-tide by waggons. Large quantities of cranberries are gathered at the back of this beach, and sent to San Francisco.

GRAY HARBOUR.—The entrance to this bay is formed by Point Hanson on the South, and the southern point of Eld Island on the North. The northern end of this island is connected with the outer part of Point Brown at low water, but at high tide the beaches are one-quarter of a mile apart. The bar off the entrance is subject to great and frequent changes, so that a stranger should not attempt to enter without a pilot. The following description is chiefly derived from the surveys of 1862 and 1867.

The South end of Eld Island lies N.W. by W. $\frac{1}{4}$ W., $1\frac{1}{2}$ mile from Point Hanson; its length is $1\frac{1}{2}$ mile, and the direction N.W. $\frac{1}{4}$ W., with a breadth of 200 to 400 yards. Half-way between Point Hanson and the island lies the N.E. end of a shoal or middle ground, bare at low water, and stretching S. by W. $\frac{3}{4}$ W. for $1\frac{1}{2}$ mile, with an average breadth of three-eighths of a mile. Between the N.E. end of this shoal and the South end of Eld Island passes the channel, with a width of less than five-eighths of a mile, and a depth of 16 fathoms.

The channel over the bar, which had 25 ft. water in 1867, was then situated $3\frac{1}{2}$ miles W. by S. $\frac{1}{4}$ S. from Fort Chehalis flagstaff (half a mile South of the extremity of Point Hanson), and $2\frac{1}{2}$ miles S.W. $\frac{1}{4}$ S. from the South point of Eld Island. From hence the channel ran straight to the N.E., and was marked by buoys. A survey, made in 1881, showed there was a straight entrance channel, with 18 ft. water at low tide.

The following directions applied to the entrance to Gray Harbour in 1883. The solitary tree on the South end of Brown Point must be steered for on the bearing of N. $\frac{1}{4}$ E., until the house on the North part of Hanson Point bears N.E. From this position the outer bar buoy, *black* and *white*, in 8 fathoms, should be seen; pass close to it, then steer N. by E., keeping the mound on the land immediately behind Brown Point in line with the right part of the first broad depression in the trees on Brown Point, which leads to the inner

bar buoy in 5 fathoms of water. H.M.S. *Heroine*, 1883, passed out of the North channel one hour before high water, the least depth being 27 ft.

If the buoy cannot be seen in rough weather, from the depth of 6 fathoms steer N.E. $\frac{1}{2}$ E., with Hanson Point a little on the starboard bow, between buoys Nos. 1 and 2. If they cannot be seen, the North and South breakers are a very good guide. Hanson Point should be passed within three-quarters of a cable, in 6 fathoms. Thence steer N.E. $\frac{1}{2}$ N. for the red buoy, No. 4, off Whitcomb Flats, passing it at the distance of half a cable, and then steer for Simpson's saw-mill, a little on the starboard bow.

There is a depth of 20 ft. on the bar at low water, and 14 ft. can be carried to Simpson's saw-mill from No. 4 buoy. At low water the flats are dry.

The peninsula terminated by Point Hanson is about three-quarters of a mile in breadth, and $3\frac{1}{2}$ miles long, and covered with fir to within half a mile of the point, which is a low sand-spit embracing a small marsh. The general direction of the peninsula is N.W., and inside it lies South Bay, with a width of half a mile, affording the only safe anchorage near the entrance. More than half of this bay is occupied by mud-flats. To secure the best position here, bring the northernmost trees on Point Hanson to bear S. 71° W., distant three-quarters of a mile, and anchor in the channel in $3\frac{1}{2}$ fathoms. In 1862 this position placed the vessel out of the influence of the South channel running to the Chehalis.

The anchorage under Point Brown is not only uncomfortable but unsafe to a vessel without heavy ground tackle. At this point there is no protection against the full sweep of the heavy summer winds, which, blowing at times counter to the strong currents in the bay, cause a very disagreeable short sea. Another circumstance tends to render this anchorage unsafe. Between Point Hanson and Eld Island lies the middle shoal, which, being bare at low water, confines the waters to a narrow regular channel; but when the tide rises sufficiently to cover this shoal, the conflicting currents cause a heavy overflow, especially on the large tides, strong enough to tear a vessel from her anchors.

The peninsula terminated by Point Brown is about a mile in breadth, and $4\frac{1}{2}$ miles long; its general direction is S.E. by S. The bay shore is covered with fir. The outer shore is the commencement of a sand waste, stretching towards the Copalis River. Between the timber and this waste is a large pond or lagoon, and outside that the sand is covered with coarse beach grass, and stunted lupine bushes, and out up with the tracks of bears, cougars, wolves, elk, &c. From the North end of Eld Island a body of water stretches into the sand waste parallel and near the ocean beach for about a mile. Close under the bay shore of this peninsula runs a narrow crooked channel, which Whidbey (1792) surveyed for 2 miles, and in which he found 4 fathoms.

From Point Hanson the mouth of Chehalis River bears N.E. $\frac{1}{2}$ E., distant 12 miles, and this course is the general direction of the S.E. side of the bay, except

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the indentation forming South Bay. The first bluff inside the point is named *Stearns*, bearing N.E. by E., and distant $5\frac{1}{2}$ miles; around the S.W. side of this bluff comes *John River*. Within $1\frac{1}{2}$ mile of the mouth of the Chehalis the Neuskah'l enters, coming from the S.E.

From Point Brown, Point New lies N.E. $\frac{1}{2}$ N., distant $4\frac{1}{2}$ miles, and off it are two rocks, called *Ned Rocks*. *Brackenridge Bluff* commences about three-quarters of a mile East of Point New, and extends 3 miles eastward to the low land bordering *Hoquiamts River*. From Point New the shore-line runs nearly straight to the Chehalis, distant 8 miles, and the point of Stearns Bluff lies S.E. $\frac{1}{2}$ S., distant $4\frac{1}{2}$ miles. To the N.N.W. of the line joining Points New and Brown lies *North Bay*, consisting of an immense mud-flat, bare at low water, and having an area of 22 square miles. At its head lies Saddle Hill. In the stretch of 4 miles N.W. of Point New are three small streams, called the *Typeo*, *Chinois*, and *Humtolapy*, emptying into North Bay. They work narrow, crooked channels through the mud flats, but at low water there is not sufficient depth to carry a whale-boat through them.

It is calculated that more than nine-tenths of Gray Harbour is bare at low water. Inside the entrance the area of the surface of the water, bounded by the flats bare at low tide, is only $4\frac{1}{2}$ square miles. This will give a fair idea of the limited extent of the harbour. Through the flats lying between this available space and the Chehalis, run two contracted channels. The northern commences at a point 2 miles E.N.E. from Point Brown, is the only available one, and would require buoying out for its entire length. For about 6 miles it was three-eighths of a mile wide, with a depth of 4 fathoms. The South channel commences just inside Point Hanson, and is very contracted and shallow. The flats are so extensive, and the mud so soft in places, that it is impossible to reach the shore except at high tides. This fact has retarded the development of the trade in lumber, although the shores are heavily timbered.

The trade of the bay amounts to carrying the supplies needed by a few settlers, and the people employed in the salmon fishery.

Chehalis River can be navigated by small steamers for 20 miles, to the mouth of the *Latsop* or *Salsop*, which comes from the northward, and for 25 miles farther, at high tide. Boats can go much higher. The country behind the bay appears low and flat, and well watered by the Chehalis and tributaries, which drain a section well timbered, and dotted with many small prairies and bottom lands.

Copalis River.—From Point Brown the shore-line trends about N.N.W. for 10 miles to the mouth of the Copalis. The barren waste of Point Brown continues along this shore, commencing with a breadth of over 1 mile, stretching from the ocean to a dense forest of fir, and growing narrower as it approaches the Copalis, where the timber comes to the water's edge.

This stream is about 100 yards wide, but the mouth is almost closed by a bar. Upon its banks reside the Copalis tribe of Indians, from whom the river

derives its name. Like all the streams on this coast, it abounds in salmon, but those caught here are celebrated for their richness of flavour.

From the Copalis to Point Grenville the shore runs N.W. $\frac{1}{2}$ N., about 16 miles, and continues low, nearly straight, and bordered by sand beach, which changes to shingle, disposed in long rows parallel to the coast. These ridges of shingle dam the mouths of many small streams and form ponds, abounding in trout, and well stocked with beaver and otter, according to the accounts of the Indians. The high land also approaches much nearer the beach, and forms sandstone cliffs, with rocky ledges projecting into the ocean.

POINT GRENVILLE is a bluff, rocky promontory, stretching westward about a mile, and then southward about a quarter of a mile, forming a very contracted and exposed roadstead. The 3-fathoms line extends half a mile from the beach, compelling vessels, except of very light draught, to anchor so far out, that the point and the rocks off it afford but little protection from the N.W. winds. It is useless during the winter months. The point has high hills lying behind it, and many rocks immediately off it. Two of these, about 75 ft. high, lie E. by S., 400 yards distant; another lies S.W. $\frac{3}{4}$ S., half a mile distant, with 5 and 6 fathoms around it, and this is said to show a large perforation through it, when viewed from the S.E. or N.W. Others stretch along the coast to the N.W., one of them showing from the South as a leg-of-mutton sail. The bluff itself is composed of fine sandstone, is very steep, and may be ascended by a difficult trail, which is used by the Indians. It is said to be a great resort for sea otters, which are hunted by the natives.

North of Point Grenville to Cape Flattery the shore is bold and rocky, with occasional short reaches of sand beach. The timber comes down to the water; moderately high hills approach the coast, through which empty numerous small streams, whilst the irregular Olympus Range looms up far in the interior. In winter these mountains are covered with snow, which lies in the gorges and valleys nearly the whole summer. *Mount Olympus* is the highest peak of the range. It attains an elevation of 6,545 ft., in lat. $47^{\circ} 59' N.$, long. $123^{\circ} 30' W.$

Northward of Point Grenville the coast begins to increase gradually in height; the shore is composed of low cliffs, with a beach at their base, and many detached off-lying rocks. There appears to be a current setting northward at about $1\frac{1}{2}$ mile an hour. In the vicinity of Destruction Island a strong current or tide has been experienced setting inshore.

Qué-ni-utl River.—The mouth of this small stream is between 3 and 4 miles N.W. by W. from Point Grenville, and is almost closed by the shingle and gravel thrown up by the surf. There is, however, a contracted opening for the passage of canoes in calm weather. The closing of the entrance has so dammed the river as to form a small lake inside, upon the banks of which is situated a village of the Queniutls, a race of Indians once hostile to all other tribes. With others to the northward they were notorious for their hostility and

* This island name, by which long-boat from smaller boat and murdered

vindictiveness to the whites, having taken and destroyed several Spanish, English, and Russian vessels and their crews. Hence we meet with the names Destruction Island, Isla de Dolores, Punta de Martires, &c., in this immediate vicinity. Now, however, they are ever ready to render assistance to vessels in distress. The river is said to rise in a lake at the foot of the mountains.

For 4 miles above the Queniutl the coast trends in the same direction, N.W. by W., is composed of sandstone cliffs, and bounded by many precipitous rocks, the height and direction of which are generally that of the cliff. In the Coast Survey reconnaissance of 1852 one is placed $2\frac{1}{2}$ miles off shore, in lat. $47^{\circ} 27'$, and the vessel's track is laid down inside of it. A great many large rocky islets lie close inshore in this vicinity, but northward the coast is nearly clear to Destruction Island. It makes a slight curve eastward, and alternates with bold yellow cliffs and low shores.

DESTRUCTION ISLAND.—This island is the only one found deserving the appellation after leaving the Farallones, off San Francisco. It is about 75 ft. high, quite flat on the top, covered with grass, but destitute of trees, and has high perpendicular sides of the same height as the cliffs on the main. It is said that there are some remarkable perforations through a rock near it, but these are doubtless only seen in particular directions, for in passing close to it the surveyors never noticed them. On the eastern end were formerly some rude Indian huts. In Vancouver's time he found two or three dwarf trees at either end. In running along the coast, 10 miles off, it is very difficult to make out this island, because, being within 3 miles of the main, it is projected against the coast cliffs, and cannot be distinguished from them until close upon it.

The island is about half a mile long N.N.E. and S.S.W., and 300 yards wide near its southern end. A sunken rock, with 16 ft. over it, lies about 220 yards South of the extremity of the reef off the South end, and a quarter of a mile from the island. Off the North point projects a gravelly tongue, about 200 yards long, curving to the N.W., and just beyond this a ledge sweeps one-third of a mile to the westward, with a few detached rocks outside it. Off the North end of the island and ledge a number of large detached rocks extend in the general direction of the island, nearly a mile from the edge of the bluff, and generally marked by heavy breakers.

The whole extent of the island and reefs is not more than $1\frac{1}{2}$ mile in length by half a mile wide. The soundings between the island and the shore vary from 4 to 12 fathoms. There is no shelter here from S.E. winds, and it should be avoided.*

* This island is called *Isla de Dolores* upon old Spanish maps. It received its present name, by which it is only known on the coast, in 1787, from Captain Berkely, who sent a long-boat from King George's Sound to explore as far South as lat. 47° . The crew of a smaller boat entered a shallow river, and rowed up some distance, where they were attacked and murdered by the Indians.

From Destruction Island, northward, the shore is composed of cliffs, which form a regular curve to a point bearing N.W. $\frac{1}{2}$ W. from the North end of the island, and 11 miles distant; thence the shore runs nearly straight on that course for 10 miles, to two high, abrupt, and well-marked rocks, standing a mile from shore. The outer one is bold, and covered with tall trees, but the inner one is bare. They are in about lat. 48° N., long. $124^{\circ} 43'$ W. Many others, but smaller, lie inside of them, and 19 fathoms is found close outside. Along this stretch the shore is irregular and bluff, with many high rocky islets off it.

In the indentation northward of Destruction Island, and about 4 miles from it, empties a small stream called Hooch by the Indians.

About 15 miles from Destruction Island, off the mouth of the stream called Quil-ley-ute, are two rocky islets covered with trees, the southern one having a cave in its sea-face. About 3 miles farther northward is *Table Rock*, about 70 ft. high.

FLATTERY ROCKS.—From the two rocks above mentioned to Cape Flattery in $48^{\circ} 23'$ N., the bearing is almost N.N.W., passing through a group of high, well-marked, rocky islets, in about lat. $48^{\circ} 11'$ N., named *Flattery Rocks*. Before reaching these the coast-line curves about a mile eastward, with a bluff shore nearly free from rocks for about 8 miles, when a large white rock, half a mile out, looms up prominently, and is distinctly seen against the main land.

Flattery Rocks extend between 2 and 3 miles from shore; the outer ledge is awash, with one islet on it, and the track of the coast surveying steamer is laid down inside of it, with soundings in 9 to 20 fathoms. High, abrupt, timbered islets lie inside, with their ocean faces nearly perpendicular, about 150 ft. high, and sloping landward. Where destitute of trees, these are covered with grass, bushes, &c.

From Flattery Rocks a high rocky coast, bordered by outlying rocks, extends for 8 miles, when a low sand beach occurs, receiving a small stream which runs E.N.E., and finally North, behind the mountain constituting Cape Flattery, to within 200 yards of the beach in Neé-ah Bay. A rise of 20 or 30 feet of the sea would make Cape Flattery an island, extending 5 miles (N.W.) by 3 miles in breadth. This creek is used by the outer coast Indians during the prevalence of heavy winter gales, when the passage outside the cape would be impracticable.

From Point Grenville to Cape Flattery the hills rising from the coast are about 2,000 ft. high, densely covered with trees, and cut up by innumerable valleys. The shore is inhabited by numerous tribes of Indians accustomed to war, and bitterly hostile to the whites. They are far superior to the Indians found along the southern coast. Their villages are heavily stockaded, and the houses made of cedar boards, which they have cut with great industry from the tree. Their houses are very large, and partitioned off into stalls for each

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1898.
ADDENDA,
For the Third Edition of
FINDLAY'S DIRECTORY FOR THE
NAVIGATION OF THE
NORTH PACIFIC OCEAN.

The YUKON RIVER GOLDFIELDS.—Owing to the recent discovery of extremely rich deposits of alluvial gold around the upper regions of the River Yukon, notably on that affluent known as the *Klondyke*, great attention has been devoted to ascertaining the easiest and quickest routes for reaching the goldfields from the coast, and the following information has been compiled for the use of masters of vessels bound to this hitherto but little frequented region, in addition to that already given in the Directory. Victoria, Vancouver, and Seattle are the ports used by vessels bound to or from the various approaches to the goldfields, to which there may be said to be three main routes, of which the easiest, and that most suitable for heavy cargo, is by the Yukon River, during the short season from July to October, when it is free from ice, but this is also the longest, being about 4,400 miles, and taking about six weeks from Victoria to Dawson City.

The southern route, and that preferred by many, being all in Canadian territory, is by the Stickeen River, a distance of about 1,650 miles, taking about 25 days from Victoria; but by the Chilcoot, or shortest route, 1,440 miles, via the Lynn Canal, it is claimed that the Klondyke can now be reached in about 12 days.

Ocean-going vessels discharge their passengers and cargo into river boats at St. Michael's, at Wrangel, or at Dyea or Skagway (in Lynn Canal), respectively. Each of these, and other approaches, will be more fully discussed hereafter, in the Addenda to the pages on which they are described in the Directory. Of the intense winter cold of the gold-producing regions, so close to the Arctic Circle, of the present difficulties of reaching them, and of other cognate matters, we cannot attempt to speak here, leaving these subjects to the special guides now available.

DIRECTIONS.—When navigating the waters of the British Columbian and Alaskan coasts, it must be remembered that they have not been closely surveyed, and that many uncharted dangers may and do exist. Steamers running on summer excursions through the inland waters, as far as Glacier Bay, always use the main channel of Haro Strait to reach

North Pacific Addenda.

the Gulf of Georgia. Seymour Narrows, in Discovery Passage, should not be attempted except at *slack* water. Broughton Strait is generally used, and is recommended as the safest. After passing through this strait, keep the Vancouver shore aboard, follow Goletas Channel, and enter Queen Charlotte Sound by way of Christie Pass, which is said to be safe at all times and at all stages of the tide. Issuing from Christie Pass, a straight course is laid for Pine Island, which is left to the eastward; thence for Egg Island, which is also left to the eastward, and thence the course is laid for Cape Calvert.

The inner passage is always to be preferred, for the reason that in winter there is less inconvenience from S.E. and S.W. gales, and in summer the fogs and high N.W. winds are partly avoided.

Proceeding northward from Cape Calvert, Mr. W. E. George, a qualified coast pilot, says vessels pass through Fitzhugh Sound, Lama Channel, Seaforth Channel, Milbank Sound, Finlayson Channel, and Grenville Channel to Chatham Sound. These channels, which are fairly well charted, offer no difficulties for the largest ships with an experienced pilot.

The usual track of steam-vessels through the inner channels of Alaska is from Chatham Sound to westward of Cape Fox, then through Tongas Narrows, Clarence Strait, Stikine Strait, and Sumner Strait to Cape Decision. Tongas Narrows is a perfectly safe passage for the largest steamers with a competent pilot. Sumner Strait, the best channel for large vessels, has some hidden dangers, notably McArthur Ledge, the Eye Opener, and Helen Rock. Wrangel Narrows is the passage commonly used by mail steamers of 1,000 tons burden, or 220 ft. in length, but is not a safe channel for larger vessels, or those exceeding 17 ft. draught, and its passage should only be attempted at high water slack.

From Cape Decision to Juneau, through Chatham Straits, Frederick Sound, and Stephen Passage, is open, clear navigation, for which the charts are sufficiently reliable, and, with an experienced pilot, there is no difficulty. Large steam-vessels bound to Sitka should take the sea passage via Cape Ommaney, but, if required to touch at Juneau, may proceed to sea from there by way of Cross Sound.

Cross Sound presents no difficulties to navigation, except that at times great quantities of ice-floes, drifting with the strong currents, render the passage somewhat dangerous, and only to be undertaken in clear weather, or daylight. Anchorages may be found at Hooniah, Willoughby Cove, Bartlett Bay, and along the S.E. shore of Gustavus Point, towards Pleasant Island. The passage inside Pleasant Island, to the northward, also affords fair anchorage, but, in the absence of surveys, should not be attempted without a local pilot.

For remarks as to Magnetic Variation, see the Addenda for page 324.

For the routes between Victoria, Vancouver, and Nanaimo, see the Addenda for page 399.

Page 318.—Sonora Reef.—Between *Point Grenville* and *Cape Elizabeth*, $3\frac{3}{4}$ miles to N.W. by W. $\frac{3}{4}$ W., a dangerous breaking reef is reported to extend $1\frac{1}{2}$ mile seaward.

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Pages 318-319, 320.—The *Queniutl Indians* are now under Government control, and always ready and anxious to render all the aid they can to rescue and assist those who may be unfortunate enough to be cast away on their shores. The currents on this coast appear to be uncertain, the wreck and loss of the ship *Port Gordon*, in 1888, being attributed to a strong southerly current, whereas competent authorities have reported a set in the opposite direction.

Page 319.—**DESTRUCTION ISLAND LIGHTHOUSE**, on the S.W. end, is a white iron tower, 80 ft. high, showing a *flashing bright* light every 10 seconds, elevated 144 ft., and visible 18 miles. In foggy weather, a *Siren* sounds a blast of 5 seconds in every minute.

Page 320.—**FLATTERY ROCKS.**—A *red Whistle Buoy* lies in $24\frac{1}{2}$ fathoms, $1\frac{1}{2}$ mile S.W. by W. $\frac{1}{2}$ W. from *Umatilla Reef*, and 13 miles S. $\frac{3}{4}$ E. from Cape Flattery lighthouse. It is proposed to place a *lightvessel* hereabout.

Page 322.—**STRAIT of JUAN de FUCA.**—Rocky shoals and dangers are usually marked by kelp during the summer and autumn, and vessels should keep clear of it. In winter and spring it is not always visible.

Pages 323, 405.—*Soundings.*—In June, 1897, a sounding of 26 fathoms, very coarse sand, was reported from the steamer *Mogul*, when in latitude $48^{\circ} 46' N.$, long. $126^{\circ} 36' W.$, outside the 100-fathoms line as shown on the chart. Another quick cast showed no bottom at 98 fathoms.

A 13-fathoms bank is said to lie about $14\frac{3}{4}$ miles N.W. by W. $\frac{3}{4}$ W. from Cape Flattery lighthouse. In 1889, H.M.S. *Swiftsure* found 20 fathoms hereabout.

Pages 324, 392.—*Fog.*—Observations taken during 7 years, 1886-1892, show that from November to June there is not much fog in the strait, April being the clearest month. July, August, and September, are the foggiest months, the average for these at Cape Flattery being 119, 183, and 120 hours respectively; at Ediz Hook, 80, 86, and 65 hours; at Dungeness, 69, 88, and 77 hours; and at Wilson Point, 48, 65, and 82 hours.

Magnetic Variation.—In 1889, Mr. Cumming Dewar, of the yacht *Nyanza*, reported that when about 5 miles from the Vancouver Island shore, between the River Jordan and Beechey Head, the compasses were powerfully affected by some local attraction, which disappeared as the vessel was kept more over towards the mainland.

Recent information shows that the magnetic variation, between Vancouver Island and the mainland of British Columbia, is also changing much more rapidly than was previously supposed. In 1897, at Vancouver Harbour there appeared to have been an increase of about $1^{\circ} 35'$ since 1891. At Baynes Sound, the chart showed the variation as about $23\frac{1}{2}^{\circ} E.$, but observations showed it to be more than 26° . Similar results have also been obtained in other localities, and mariners are advised to bear this in mind, when navigating in these waters.

Page 326.—**CAPE FLATTERY LIGHT**, on Tatouch Island, now shows a *red* sector over Duncan and Duntze Rocks, between N. $39^{\circ} W.$ and N. $32^{\circ} W.$ It is obscured to the eastward, between N. $73^{\circ} E.$ and S. $15^{\circ} E.$,

but eastward of Chibadehl Rocks it is not visible till northward of N. 68° E. There is a *Signal Station* here, with telegraphic communication.

Vessels are recommended not to pass between Tatouch Island and Duncan Rock, as breakers have been seen about 1½ cable S.E. and eastward of the latter. In 1893, a 4-fathoms shoal was reported to lie 7½ cables N. by W. ¾ W. from Tatouch Island lighthouse.

Pages 326-327.—Nee'ah Bay.—A small *fixed bright light*, elevated 16 ft., is shown on a post on *Ba-ad-dah* or *Mee-na Point*, the eastern point of the bay. A *red Whistle Buoy* lies in the entrance, in about 22 fathoms, 4 cables N.W. of the North end of Waaddah Island.

Pages 328-329.—Port Angelos.—In foggy weather, a *Bell* is sounded in a white tower, 108 yards N.W. by N. from *Ediz Hook* lighthouse, being struck by machinery once every 15 seconds.

Page 329.—New Dungeness.—A *red buoy* was placed in 4½ fathoms, off the extremity of the spit.

Page 331.—Libby Rock, with 11 ft. over it, lies about 7½ cables off Middle Point, and 3¼ miles W.S.W. of Wilson Point lighthouse; a *red buoy* lies northward of it, in 8 fathoms.

Page 331.—WILSON POINT LIGHT is now *fixed bright*, varied by a *red flash* every 20 seconds. A *red buoy* lies in 7 fathoms, off the foul ground N.W. of the point, with the point bearing E. by S. ¾ S., distant 7½ cables. Another *red buoy* lies in 5 fathoms, off Point Hudson, 1½ mile S.E. ¾ S. from the lighthouse.

Pages 331-332.—PORT TOWNSEND now contains about 5,000 inhabitants, and carries on a considerable trade in the export of timber. The wharves have a depth of 20 ft. alongside. There are some small engineering works here, and provisions are plentiful. A large well appointed new hospital was opened in 1895, superseding the previous one. In 1896, the exports were valued at £763,827, and the imports at £86,500; in that year, 1,919 vessels entered, with a total tonnage of 980,081. Pilotage is optional, and vessels can obtain the aid of steamtugs, if required. There is railway communication with the western shore of the northern branch of Hood's Canal. There are facilities for rating chronometers at the custom-house. Vessels entering Puget Sound must first clear at the *Quarantine Station* at Diamond Point.

In March, 1898, the steamer *Victoria*, drawing 18 to 21 ft., struck heavily on some obstruction among the kelp, at about 3¼ cables S.E. ¾ E. from the custom-house.

Lights.—A small *fixed red lantern light* is shown on *Hudson Point*; and another, elevated 22 ft., on *Marrowstone Point*. At the latter a *Bell* is sounded in foggy weather, two quick blows every 15 seconds.

Page 333.—PUGET SOUND, &c.—Reliable pilots may be obtained for the navigation of these waters, but at present pilotage is not compulsory.

Page 333.—Bush Point is marked by a small *fixed bright light*, elevated 25 feet.

Page 333.—*Port Townsend.*—*Signal Station* here in 1893, a 4-fathoms shoal was reported to lie 7½ cables N. by W. ¾ W. from Tatouch Island lighthouse. *Pages 326-327.*—*Nee'ah Bay.*—A small *fixed bright light*, elevated 16 ft., is shown on a post on *Ba-ad-dah* or *Mee-na Point*, the eastern point of the bay. A *red Whistle Buoy* lies in the entrance, in about 22 fathoms, 4 cables N.W. of the North end of Waaddah Island. *Pages 328-329.*—*Port Angelos.*—In foggy weather, a *Bell* is sounded in a white tower, 108 yards N.W. by N. from *Ediz Hook* lighthouse, being struck by machinery once every 15 seconds. *Page 329.*—*New Dungeness.*—A *red buoy* was placed in 4½ fathoms, off the extremity of the spit. *Page 331.*—*Libby Rock*, with 11 ft. over it, lies about 7½ cables off Middle Point, and 3¼ miles W.S.W. of Wilson Point lighthouse; a *red buoy* lies northward of it, in 8 fathoms. *Page 331.*—*WILSON POINT LIGHT* is now *fixed bright*, varied by a *red flash* every 20 seconds. A *red buoy* lies in 7 fathoms, off the foul ground N.W. of the point, with the point bearing E. by S. ¾ S., distant 7½ cables. Another *red buoy* lies in 5 fathoms, off Point Hudson, 1½ mile S.E. ¾ S. from the lighthouse. *Pages 331-332.*—*PORT TOWNSEND* now contains about 5,000 inhabitants, and carries on a considerable trade in the export of timber. The wharves have a depth of 20 ft. alongside. There are some small engineering works here, and provisions are plentiful. A large well appointed new hospital was opened in 1895, superseding the previous one. In 1896, the exports were valued at £763,827, and the imports at £86,500; in that year, 1,919 vessels entered, with a total tonnage of 980,081. Pilotage is optional, and vessels can obtain the aid of steamtugs, if required. There is railway communication with the western shore of the northern branch of Hood's Canal. There are facilities for rating chronometers at the custom-house. Vessels entering Puget Sound must first clear at the *Quarantine Station* at Diamond Point. In March, 1898, the steamer *Victoria*, drawing 18 to 21 ft., struck heavily on some obstruction among the kelp, at about 3¼ cables S.E. ¾ E. from the custom-house. *Lights.*—A small *fixed red lantern light* is shown on *Hudson Point*; and another, elevated 22 ft., on *Marrowstone Point*. At the latter a *Bell* is sounded in foggy weather, two quick blows every 15 seconds. *Page 333.*—*PUGET SOUND, &c.*—Reliable pilots may be obtained for the navigation of these waters, but at present pilotage is not compulsory. *Page 333.*—*Bush Point* is marked by a small *fixed bright light*, elevated 25 feet.

Page 335.—Port Madison.—A small *fixed red light*, elevated 25 ft., is shown on *Monroe Point*, at 150 yards from the end of the spit, on the S.E. side of the entrance.

Port Orchard.—A government dry dock was opened at the Naval Station here in 1896, being constructed of timber, with a masonry entrance and concrete floor. It is 675 ft. long, with an entrance 92 ft. wide, having 30 feet over the sill at mean high water.

Duwamish Bay.—A small *fixed bright light*, elevated 12 ft., is shown on *Battery Point*. A *red Bell Buoy* lies in 6 fathoms, close off the spit extending N.N.W. of *Duwamish Head*.

Pages 335-336.—West Point Lighthouse.—In foggy weather a steam *Trumpet* sounds a blast of 5 seconds in every half-minute. The *Bell* is discontinued.

SEATTLE now has about 70,000 inhabitants, and is the largest and most thriving town of this region, being connected with the Canadian and United States main railways, and having lines of steamers to Alaska, Japan, &c. It is also the headquarters of the Puget Sound fisheries. There are shipbuilding and engineering works, where ordinary repairs can be executed, and also several large sawmills. The patent slip will only take up small vessels. The wharves have depths of 40 to 45 ft. alongside, and the head of the bay is being deepened and improved by dredging. Coal is stored in large quantities. The exports are chiefly wheat, flour, tinned salmon, and timber, valued at £219,874 in 1896; the imports were valued at £36,283. In that year, 113 vessels entered the port, with a tonnage of 126,505.

Page 336.—Eagle Harbour.—Two buoys have been placed in the entrance, a *red* one near the S.E. extremity of *Wing Point* reef, and a *black* one off the spit on the South side of the entrance.

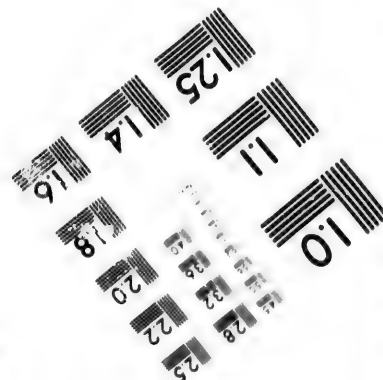
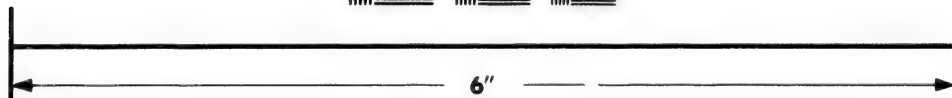
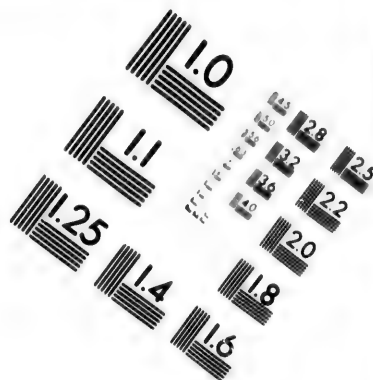
Blakeley Harbour.—There are some iron and wood shipbuilding yards here.

Restoration Point.—*Decatur Reef*, extending off *Restoration Point*, is marked by a *red buoy*, in 8 fathoms, on its eastern side, 2 cables E. by S. $\frac{1}{2}$ S. from the point.

Page 337.—Rich Passage is the narrow channel southward of *Bainbridge Island* into *Port Orchard*. A small *fixed bright light*, elevated 25 ft., is shown on *Orchard Point*, on the South side of the entrance. A *pole beacon* stands on *Orchard Rocks*, on the East side of the passage, and a *red buoy* lies in 8 fathoms, 2 cables S. $\frac{1}{2}$ E. from them.

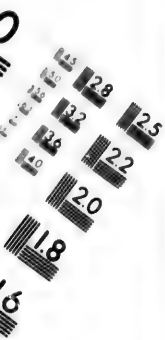
Page 337.—Commencement Bay.—A small *fixed bright light*, elevated 12 feet, is shown on *Brown Point*, on the North side of the entrance.

Page 338.—PORT TACOMA is now connected with the Canadian and United States railway systems, and is the chief place of trade of this region, having lines of steamers to Japan, &c. The town now contains about 40,000 inhabitants. Coal is stored here in large quantities, and there are spacious warehouses at the wharves, alongside which the largest vessels can lie afloat, in 30 to 40 ft. water. There are several foundries



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and engineering works, and large sawmills. The exports are chiefly wheat, flour, cotton and woollen goods, and timber, valued at £1,236,040 in 1896. Steamtugs may be had, and are sometimes met with as far seaward as Cape Flattery.

Page 338.—**Quartermaster Harbour.**—A *red buoy* lies in 8 fathoms, off Piner Point shoal, on the East side of the entrance. There is a floating dry dock here, 325 ft. long, capable of raising a weight of 5,000 tons, and there are facilities for repairs, &c.

Page 338.—**Maury Island** is separated from the S.E. side of Vashon Island by a channel with 4 fathoms least water in it. On *Robinson Point*, its eastern extreme, is a white frame lighthouse, 25 ft. high, showing a *fixed red light*, elevated 40 ft.; in foggy weather, a steam *Whistle* sounds a blast of 6 seconds in every minute.

Page 339.—**Belch Passage.**—A small *fixed bright light*, elevated 25 ft., is shown on the South end of Eagle Island.

Page 340.—**Olympia** now contains about 4,500 inhabitants. A channel 400 ft. wide, with 6 ft. in it at low water, has been dredged to the wharf, and improvements are still in progress.

Page 341.—**Port Gamble.**—A *black can buoy* lies in 16 ft., near the mud bank on the East side of the narrow entrance channel.

Page 342.—**Everett**, at the mouth of the *River Snohomish*, on the eastern side of the southern part of Possession Sound, is an important town, connected with the railway system, and having iron and shipbuilding works, paper mills, &c.

Pages 342, 343.—**Port Susan, &c.**—The channel over the flats at the North end is marked by *red spar buoys* on its eastern side, in depths of 9 to 10 ft. at high water. The western side of the channel over the flats in Skagit Bay, from *Utsalady* to *Stanwood*, on *Stillaguamish River*, is marked by similar *buoys*, in 12 to 15 feet. The southern side of the channel, from *Utsalady* to *Skagit River*, is also marked by similar *buoys*, in 12 to 16 feet. Several small *lights* are shown for the use of coasting vessels, in *Skagit Bay*, &c.

Page 343.—**Partridge Point.**—A *red Bell Buoy* lies in 15½ fathoms, outside the kelp, and about 1 mile off the point, with *Wilson Point lighthouse* bearing S.E. ½ S.

Page 344.—**Deception Passage.**—A small *fixed bright light*, elevated 40 feet, is shown on the S.W. point of *Fidalgo Island*.

Page 344.—**ROSARIO STRAIT.**—*Lawson Reef* is marked by a *Bell Buoy*, painted in *red and black bands*, lying in 6 fathoms off its eastern side, with *Smith Island lighthouse* bearing S.W. by S. ¾ S., and *Deception Islet* N.E. by E., the latter distant 1½ mile.

Page 345.—**Burrows Bay.**—A small *fixed bright light* is shown on the end of the wharf.

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Page 346.—Guemes Channel is the passage between Guemes Island and the North end of Fidalgo Island, and has a *red buoy* lying in 4 fathoms, on the South side of the western entrance, at 3 cables N.E. $\frac{1}{2}$ N. from *Shannon* or *Ship Point*. *City of Seattle Rock*, with 9 $\frac{1}{2}$ ft. over it, is marked by a *red buoy*, in 14 feet. There is a branch railway from the mainland to Shannon Point, passing the settlement of *Anacortes*, on the North side of Fidalgo Island. In clear weather, with a strong flood tide, vessels bound to Bellingham Bay from the southward usually pass through this channel.

Pages 346-347.—Bellingham Bay, &c.—Several dangers have been found in the channels leading to Bellingham Bay, and buoys have been placed to mark some of them. Some small *lights* are also exhibited, to assist in the navigation, which is not recommended without local knowledge or the aid of a pilot. With ebb tide, small vessels bound westward pass through *Hale Passage*, eastward of Lummi Island.

Page 348.—Drayton Harbour.—A small *fixed red light* is shown on some piles in 4 fathoms, off Tongue Point, on the South side of the channel leading to *Blaine*. This town is connected with the railway system.

Page 348.—Mud Bay, the N.E. angle of Boundary Bay, is filled by a mudflat, dry at low water, through which are several very shallow channels, marked by pile *beacons*, leading to *Nicomeck's River*.

Page 352.—Davidson Rock is marked by a *black can buoy*, in 26 feet.

Page 353.—Belle Rock is marked by a *black can buoy*, in 9 fathoms, to E. by S. $\frac{1}{4}$ S.

Page 353.—Black Rock is marked by a *pole beacon*, bearing a *barrel*.

Page 354.—Lummi Island.—A rock, with 12 ft. over it, about half a mile W.N.W. of Migley Point, the North point of the island, is marked by a *nun buoy*, in 7 fathoms, close to its S.E. side. A ledge, with 12 to 15 ft. over it, extends about three-quarters of a mile E. by N. $\frac{1}{4}$ N. from Migley Point.

Page 355.—Cattle Point.—A small *fixed bright light*, elevated 100 ft., is shown on the southern extremity of San Juan Island.

Salmon Bank.—A *black can buoy* lies in 5 fathoms, on the outer edge, with Cattle Point light bearing North.

Page 356.—Griffin Bay.—*New Shoal*, with 3 ft. over it, in the fairway of the entrance to North Bay, 6 cables E. by N. from the North end of Dinner Island, is marked by a *spar buoy*.

Turn Rock is marked by a *pole beacon*, bearing a *barrel*.

Page 357.—Patos Island.—A small *fixed red light*, elevated 30 ft., is shown on *Alden Point*, the western extremity; in foggy weather, a *Daboll Trumpet* sounds a blast of 2 seconds in every 20 seconds.

Page 358.—Clements Reef is marked by a *red nun buoy*, lying in 13 fathoms, about 2 $\frac{1}{2}$ cables N.E. of it.

Page 359.—Upright Channel.—*High Water* or *Shag Rock* is marked by a *pole beacon*, bearing a *barrel*.

Page 361.—Thatcher Passage.—*Lawson Rock* only uncovers at very low tides, and is marked by a *can buoy*, painted in red and black bands, lying in $6\frac{1}{2}$ fathoms, near its southern edge.

Page 361.—Obstruction Island.—A small *fixed bright light*, elevated 24 feet, is shown on the S.E. point, and a *fixed red light* on the S.W. point. A pole *beacon*, bearing a *barrel*, stands on a rock in *Peavine Pass*, close to the North end of *Blakely Island*.

Page 364.—Discovery Island Light, &c.—See Addenda for page 402.

Page 365.—Zero Rock is awash at high water, and is marked by a *black stone beacon*, with a pole bearing a conical topmark, elevated 28 feet.

Kelp Reefs.—A *stone beacon*, 20 ft. high, stands on the eastern side, and the buoy has been removed. A 3-fathoms patch lies northward of *Davey Island*.

Page 366.—SATURNA ISLAND Lighthouse is a square white wooden tower, 60 ft. high, standing on the East point, showing a *revolving bright light* every half-minute, elevated 125 ft., and visible 18 miles seaward, between N.W. by W. $\frac{1}{4}$ W. and S.W. $\frac{1}{4}$ S.

Orcas Knob, well open East of *Waldron Island*, S.E. by S. $\frac{1}{4}$ S., leads clear of the foul ground eastward of *Tumbo Island*.

A *conical black buoy* was placed in 12 fathoms, off the extremity of the reef extending over 1 mile off the East point of *Saturna Island*.

Page 366.—Cormorant Bay.—A 2-fathoms rock, usually marked by kelp, lies $2\frac{1}{4}$ cables S.S.W. of the S.E. rock of *Johnstone Reef*.

Page 367.—Plumper Sound.—A small rocky patch, with about 16 ft. over it, lies on the eastern side, $2\frac{1}{4}$ cables W. by N. from *Croker Point*.

Page 368.—Mayne Island.—A 2-ft. rock lies in the kelp, at $1\frac{1}{4}$ cable E. by S. from *Edith Point*, on the North coast.

Page 369.—Stuart Island.—A small *fixed bright light*, elevated 35 ft., is shown on *Turn Point*, and in foggy weather a *Trumpet* sounds a blast of 3 seconds in every half-minute.

Page 371.—Directions.—With a strong flood tide, vessels bound to the southward from *Roche Harbour* are recommended to pass through *Spieden* and *President Channels*, passing westward of *Barnes Island* into *Rosario Strait*. With the ebb, in clear weather, *Spieden* and *San Juan Channels* can be used.

Page 372.—Sidney Channel.—On the coast, in lat. $48^{\circ} 39' N.$, is the town of *Sidney*, off which shoal ground extends for about 3 cables, its outer edge being marked by two *red spar buoys*. A depth of 9 ft. is found about $3\frac{1}{4}$ cables N. by E. $\frac{1}{4}$ E. from the wharf.

A *black spar buoy* lies on the S.E. edge of the two 3-fathoms patches West of *Darcy Island*, in the southern entrance of the channel.

A rock, with 20 ft. over it, lies about 1 cable off the West side of *Sidney Island*, with the beacon on *Sidney Spit* bearing N.W. by N. $\frac{1}{4}$ N., distant $1\frac{1}{4}$ mile.

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A 3-fathoms spit extends about 3 cables northward from the N.E. point of *James Island*.

Sidney Spit has a conical white wooden *beacon*, 50 ft. high, on its N.W. extreme. A *spar buoy*, painted in red and black bands, lies in 16 ft., on the S.E. rocky patch off the N.W. end of *Sidney Island*.

Page 373.—**Shute or Colburne Passage.**—A spit extends 400 ft. from low-water mark off the West side of *Knapp Island*. The passage between *Knapp* and *Piers Islands* is safe, having $5\frac{1}{2}$ fathoms least water. Several dangerous rocks lie in the passage westward of *Coal Island*. The narrowest part of the channel is marked by two *buoys*, about 1 cable apart; *Cape Keppel* in one with *Cowitchin Head*, W. 3° S., leads through the passage, in 8 to 10 fathoms, between the *buoys*, and clear of all danger. In 1896, this district was reported to be incorrectly shown on the chart published by the British Hydrographic Office.

Page 375.—**Admiral Island.**—A red *spar buoy* lies near the S.W. edge of *Kelp Reef*, off the S.W. coast, about 3 cables S.W. by S. from *Entrance Point*.

Page 375.—**Cowitchin Harbour.**—A red *spar buoy* lies on the end of the reef, on the East side of the entrance to *Mill Creek*.

Page 376.—**Osborn Bay.**—A black *spar buoy* lies on a rock, just drying at low water, eastward of *Shoal Islands*.

Page 377.—**Bare Point Light.**—A fixed bright light, elevated 36 ft., and visible 11 miles, is shown from a lantern on a white house 30 ft. high.

A rock, nearly awash at low water, lies 2 cables eastward of *Yellow Point*.

Page 378.—**Grappler Reef** is marked by a *spar buoy*, lying in 7 fathoms, off the S.W. extreme.

Page 381.—**Prevost Island Lighthouse.**—On *Portlock Point* is a white wooden tower, 48 ft. high, showing a fixed light, elevated 72 ft., and visible 10 miles; it shows bright, with a red sector over *Enterprise Reef*. In foggy weather, a *Bell*, 300 yards S.E. of the lighthouse, is struck once every 15 seconds.

Page 381.—**ACTIVE PASS.**—*Enterprise Reef* dries about 18 inches at low water, and on its western part is a white conical *beacon*, standing on piles, and bearing two balls, rising 22 ft. above high water.

Page 382.—*Gossip Island* reef is marked by a black can buoy, in 5 fathoms, **Georgina Point Lighthouse**, on the eastern side of the North entrance to *Active Pass*, is a square white building, 42 ft. high, showing a fixed bright light, elevated 55 ft., and visible 12 miles northward, between S.W. $\frac{1}{2}$ S. and E. $\frac{1}{2}$ N. In foggy weather, a *Horn* sounds a blast of 8 seconds in every minute.

Page 384.—**Governor Rock** is marked by a conical black buoy, lying in 7 fathoms, off its eastern side.

Page 385.—**Portier Pass** should be avoided, owing to the numerous rocks in it. *Romulus Rock*, with $3\frac{1}{2}$ fathoms over it, lies on the South side of *North Pacific Addenda*.

the western entrance, 9 cables E. by S. $\frac{1}{2}$ S. from Cardale Point. A 10-ft. rock lies two-thirds of a cable S.E. by S. $\frac{1}{2}$ S. from Virago Rock. A 4-fathoms rock lies 3 cables N.W. $\frac{1}{2}$ N. from Tongue Point. A 3 $\frac{1}{2}$ -fathoms rock lies 3 $\frac{1}{2}$ cables S.E. by S. $\frac{1}{2}$ S. from Canoe Islet centre, and a reef extends from it to the rock southward of Canoe Islet.

Page 387.—False Narrows.—The channel has about 3 fathoms at high water, and is marked by *buoys* and *beacons*, but should not be attempted without a thorough acquaintance.

Pages 390, 405.—Currents.—Off Juan de Fuca Strait, and along the western coast of Vancouver Island, the currents appear to depend to some extent upon the force and direction of the wind. In winter, the prevailing winds being between S.E. and S.W., the tendency is to produce a northerly set, and numerous instances have occurred of such a set.

The ebb tide divides into two branches between Cape Flattery and the Vancouver shore, one turning sharply to the southward around the cape, and the other sets to the westward along the Vancouver Island shore. The flood sets invariably to the northward into all the sounds running into the Vancouver coast.

Page 392.—Fog.—See Addenda for page 324.

Pages 393, 405.—CARMANAH Lighthouse, 2 miles W. by N. $\frac{1}{2}$ N. from Bonilla Point, is a white wooden building, 46 ft. high, showing a *flashing bright light*, elevated 173 ft., and visible 19 miles. It shows *three flashes*, separated by intervals of 15 seconds, and followed by a partial eclipse of 30 seconds.

In foggy weather, a *Horn* sounds a blast of 6 seconds every half-minute.

A *Signal Station* is established at the lighthouse, connected with Victoria by telephone, for the use of which there is a tariff. In foggy weather, vessels may communicate with the keepers by whistle sounds, using the Morse or Continental telegraphic codes, and they will be answered by a whistle.

A depot of provisions, and other necessities, has been established at the lighthouse, for the benefit of persons wrecked on the coast. Notice boards have been erected along the coast between Cape Beale and Port San Juan, giving information necessary for those in distress. As wrecks do not usually break up rapidly on this coast, seamen are advised to stay by the ship as long as possible, the loss of life on these occasions being mainly owing to attempts to get ashore, or from exposure afterwards.

Page 393.—Port San Juan has a small settlement at its head, with a telephone station.

Page 394.—Sooke Harbour.—The fairway of the channel to the wharf on the western shore is marked by pile *beacons*, three to starboard painted *red*, and one to port painted *black*. About 1 cable S. by W. $\frac{1}{2}$ W. from the latter is a dangerous rock, awash at low water, lying opposite to a white triangle fixed on a tree on the eastern shore, with 1 $\frac{1}{2}$ fathom in the narrow channel between.

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Page 395.—Race Island Lighthouse.—In foggy weather, a steam whistle will give four short blasts, in answer to a steamer's signals, if the northern portion of Juan de Fuca Strait is free from fog, as is often the case.

Page 396.—William Head is the site of the *Quarantine Station*, and two small *fixed red lights* are shown for the guidance of vessels coming hither for inspection. Such vessels must proceed northward until these lights are abeam, and then westward until they are in line, to S. by W. $\frac{1}{2}$ W., defining the limit of the quarantine anchorage, which is also defined by Race Rock light being shut in by the head.

Page 398.—ESQUIMALT is connected with Victoria, $3\frac{1}{2}$ miles distant, by a tramway. The dry dock is 480 ft. long, by 65 ft. wide, with 29 ft. over the sill at high springs. A slip will also take up vessels 320 ft. long, and drawing 22 ft., of 2,500 tons weight. Ordinary repairs can be executed for vessels and their machinery. Moorings are laid down in Constance Cove. Water can be obtained from a hydrant at the dock.

A 5-ft. rock lies near the South shore of *Plumper Bay*, about 3 cables S.E. by S. $\frac{1}{2}$ S. from Dyke Point beacon, with a depth of 14 ft. between it and the North coast of Inskip Island.

Page 399.—VICTORIA HARBOUR.—*Berens Island Light* is now *occul-ting*, eclipsed for 5 seconds once in every 20 seconds, and visible 10 miles; it shows *bright*, with a *red sector* over Brothchy Ledge between S. 31° E. and S. 36° E. In foggy weather, a *Bell* is sounded in answer to vessels' signals.

Shoal Point buoy has been removed, and the spit is now marked by a red pile beacon, on which a *fixed red light* is shown, visible 3 miles. *Pin Rock*, farther in, is marked by a similar beacon, bearing a *fixed bright light*.

VICTORIA contained 16,841 inhabitants at the census in 1891, but the population now numbers upwards of 25,000, it having increased greatly in importance since the growth of railway and steam communication. The railway is now open to Nanaimo, 73 miles distant, and there is daily communication by steamer with Vancouver, the terminus of the Canadian Pacific Railway. The outer wharf has a depth of 30 ft. alongside, and is furnished with cranes and sheds. There are several slips, for vessels up to 1,000 tons weight, and ordinary repairs can be executed. Steamtugs can be had, if required. The hospital will admit seamen.

Brothchy Ledge.—When strongest, the tidal stream sets towards this danger at a rate of about 3 knots an hour.

Directions.—*Victoria to Vancouver.*—In clear weather, with flood tide, the American authorities recommend the following route, the distance being shortest, water smoothest, and tide of the most assistance:—

Enterprise, Mayor, and Baynes Channels, Sidney Channel (passing westward of Moresby Island and the islands southward of it); thence through Swanson Channel and Active Pass, and across to Burrard Inlet.

With the *ebb* tide, the usual route is outside Trial Island to the main channel of Haro Strait, following the latter to the Gulf of Georgia. This

route is recommended in thick weather, and also, at all times, to navigators not familiar with the tides and dangers of the narrower channels.

Some of the fastest steamers, after passing outside Trial Island, and partly through Haro Strait, at ebb tide, stand up Swanson Channel and through Active Pass.

Victoria to Nanaimo and Departure Bay.—With flood tide and clear weather, pass through Enterprise, Mayor, Baynes, Swanson, and Trincormalie Channels, and Dodd Narrows. By this route the smooth water and strong tide will be of great assistance. On the southward trip this route should also be followed when the tide is ebb.

With adverse tides the usual route is through the main channel of Haro Strait and the Gulf of Georgia.

Page 402.—**Fiddle Reef** is marked by a conical white beacon, bearing a staff and cage, elevated 50 ft. above high water.

Page 402.—**DISCOVERY ISLAND Lighthouse**, on *Sea Bird Point*, the East extreme, is a square white wooden tower, 47 ft. high, showing a fixed bright light, elevated 91 ft., and visible 15 miles seaward, between N. 42° W. and S. 31° W. In foggy weather, a Horn sounds a blast of 8 seconds, with intervals of 1 minute.

A 9-ft. rock, marked by kelp, lies about 4 cables S.S.W. of *Sea Bird Point*, and a 15-ft. rock lies 75 yards N.N.W. of the 9-ft. rock, with 4 fathoms between.

Page 405.—**Tides, &c.**—See Addenda for page 390.

Soundings.—See Addenda for page 323.

Bonilla Point should not be approached within 1 mile, as shoal ground extends more than half a mile off it, with deep water near the edge of the reef.

Carmanah Lighthouse.—See Addenda for page 393.

Page 406.—**Pachena Bay.**—Several rocks are reported to lie in the passage between *Seabird Islet* and the eastern shore.

Page 407.—**CAPE BEALE Lighthouse.**—In May, 1898, the light is to be altered to show a red sector over the dangers, between about West and N.N.W. A depot of provisions, &c., has been established here, for the benefit of shipwrecked persons (see Addenda for page 393). There is telephonic communication with Victoria, messages being transmitted at tariff rates.

Bamfield Creek.—A 6-ft. rock lies nearly in mid-channel, about halfway from the entrance to the anchorage. A 3-ft. rock lies in the middle of the narrow channel between *Burl Island* and *Rance Island*.

Ship Islet is now bare of trees.

Page 408.—**Diana Island.**—*Todd Rock* has 1 to 2 ft. over it at high water, and a 3-fathoms kelp patch lies about 100 yards eastward of it. *Self Point*, the eastern extremity of *Helby Island*, appears like a wooded islet, and is an excellent mark at night.

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Page 409.—Alberni Inlet.—A rocky patch, drying 3 to 4 ft. at low water, lies near the head of *San Mateo Bay*. The rock said to lie off *Mutine Point* has been searched for in vain, but an 8-ft. rock lies about 1 cable off shore, northward of the point, at $5\frac{1}{2}$ cables N.N.E. of the North point of Turn Island.

Page 410.—Stamp Harbour.—*Sumass River* has 3 ft. least water in its entrance, deepening to 5 ft. within. The channel is marked by *spar buoys*, black to West, and red to East.

Pages 413-414.—BROKEN GROUP.—Several sunken rocks have recently been discovered in the channels among these islands, and others may exist.

415.—Seahart Channel.—A rock, drying at very low tides, lies 1 cable E. by N. $\frac{1}{2}$ N. from the eastern extremity of Canoe Island, and another, drying 2 ft., lies 150 yards farther on. On the coast, opposite Canoe Island, is *Anderson's Wharf*, 202 ft. long, reaching into 3 fathoms water.

Page 416.—WESTERN CHANNEL.—In 1887, *beacons* were erected on *Round Island* and *Castle Island*, but they have been blown down, and will probably not be replaced. A reef, breaking at low water, extends $1\frac{1}{2}$ cable N. by W. from *Channel Rock*. A rock, awash at low water, lies over 1 cable N. $\frac{1}{2}$ W. from the North point of *Gowlland Island*.

Page 418.—Ucluelet Arm.—A $3\frac{1}{2}$ -fathoms rocky patch lies in *Carolina Channel*, at $1\frac{1}{2}$ cable E. $\frac{3}{4}$ N. from the islet on the S.W. side of *Round Island*. A 5-ft. pinnacle rock lies nearly 100 yards off the South entrance point of *Stewart Bay*, and $4\frac{1}{2}$ cables S.E. $\frac{1}{2}$ E. from *Native Islet*. Another 5-ft. rock lies $4\frac{1}{2}$ cables S.E. by S. $\frac{1}{2}$ S. from *Native Islet*. A rock, drying 2 to 3 ft., lies $5\frac{1}{2}$ cables S.E. $\frac{1}{4}$ S. from *Native Islet*. A $2\frac{1}{2}$ -fathoms rock lies 3 cables N. $\frac{1}{2}$ E. from the wharf in the bay on the South side of *Ucluelet Arm* entrance.

Page 419.—Sutton Rocks, with 7 to 10 ft. least water, and 4 fathoms close around, lie 2 cables S.E. $\frac{3}{4}$ E. from the S.E. extreme of *Channel Islet*, and a *spar buoy*, painted in red and black bands, lies on the southern rock.

Page 420.—CLAYOQUOT SOUND.—A breaking rock lies about half a mile W. by S. from the summit of *Bare Island*, and another lies about $2\frac{1}{2}$ cables eastward of *Sea Otter Rock*.

Page 423.—An 8-ft. rock, marked by a red *spar buoy*, lies northward of the islets at the eastern end of *Browning Passage*. Vessels must pass to the northward of it, and of a black *can buoy* at the N.E. extremity of the spit extending northward from *Stubbs Island*.

Page 439.—Kyuquot Sound.—*Channel Rock* dries 8 ft. at low water, and to the S.E. of it is a rock drying 2 feet.

Page 441.—C'an-niniek Harbour affords one of the best anchorages on the West coast of *Vancouver Island*, and is easy of approach. *Village* or *Kyuquot Island* has a post-office and a church, and there is a large Roman Catholic chapel on the island next eastward of *Village Island*. The rock lying in the entrance has 6 ft. over it at low water, with deep water close

around; it is not marked by kelp, and lies over 6 cables W.N.W. of Channel Rock, with the S.E. extreme of Granite Island bearing S.W. $\frac{1}{2}$ S.

Pages 441-442.—Ou-ou-Kinah Inlet.—*Fairway Rock*, awash at low water, lies $10\frac{1}{2}$ cables S.W. $\frac{1}{4}$ W. from the summit of Clara Islet. The leading mark, the entrance of the inlet bearing N.N.E., is therefore not correct.

Page 443.—Nasparti Inlet.—Two rocks, marked by kelp, lie in the fairway S.E. of *Hat Island*; the inner one lies about 1 cable off the island, and the outer one, of 3 fathoms, lies $2\frac{1}{2}$ cables S.E. by S. $\frac{1}{2}$ S. from the East extreme of the island.

Page 449.—Quatsino Sound.—*Monday Shoal* is said to have less than 4 fathoms over it. Near *Hecate Cove* is a Norwegian settlement, with a store and post-office, and the wharf reaches into 3 fathoms at low water.

Page 454.—BRITISH COLUMBIA contained 98,173 inhabitants at the census in 1891, and its area is now estimated at 383,300 square miles, including Vancouver Island, &c. Victoria is the capital. The northern part of the coast is almost destitute of settlers, except for a few camps of timber cutters. The seas abound with excellent fish, and at the river mouths are extensive salmon fisheries and canneries. The South part of Vancouver Island and the Fraser River delta are suitable for the cultivation of barley, oats, and hops, but the climate is too cool and wet for the production of grain in the districts bordering on the ocean. In the more northerly parts not even potatoes can be grown.

Page 457.—STRAIT of GEORGIA.—Vessels bound from New Westminster or Vancouver to Nanaimo, with a strong head wind and flood tide, usually steam through Portier Pass (see: Addenda for page 385), and then to the northward by the inner passages. With a light or fair wind, they pass northward of Gabriola Island.

Page 459.—ROBERTS BANK is marked by two pile beacons on its western part, each being surmounted by a conical framework, reaching 12 feet above high water. The *North Sand Head beacon* stands near low-water mark, at $10\frac{1}{2}$ cables S. $\frac{1}{2}$ E. from the Sand Head lighthouse, and there is 14 fathoms water at less than 2 cables westward of it; the other stands on the S.W. edge of the bank, at $3\frac{1}{2}$ miles S.E. $\frac{1}{2}$ E. from the lighthouse.

Sturgeon Bank is also marked by two black pile beacons, each bearing a cross, lying 4 miles and $7\frac{1}{2}$ miles to N.N.W. of the lighthouse. They are liable to be washed away.

Pages 459-464.—FRASER RIVER.—*South Channel*, or *Canoe Pass*, with 4 to 8 ft. water in it, can only be used by small vessels, with local knowledge. Its entrance is close southward of the southern beacon on Roberts Bank, within which the channel is marked by eight single pile beacons.

Page 462.—Sand Head Lighthouse, on the S.W. part of Sturgeon Bank, is in lat. $49^{\circ} 5' N$. The *Fog Bell* is struck once every 20 seconds. At $7\frac{1}{2}$ cables S.W. by W. from the lighthouse, in 9 ft. water, is a black pile beacon, bearing a ball 6 ft. in diameter, rising 12 ft. above high water. At

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1 cable West of it the depth is 13 fathoms, increasing rapidly to 20 and 30 fathoms.

In 1895, the old entrance channel, which trended S.S.W. from Garry Point, was stated to have entirely closed up. The entrance of the present channel is $1\frac{1}{4}$ mile north-westward of the lighthouse, and works are in progress to ensure the permanency of it, but the aid of a pilot is necessary for strangers. The tree on *Garry Point* has disappeared; it is proposed to erect a *beacon* here.

Buoys.—A *red Bell Buoy*, surmounted by a staff and ball, 16 ft. high, lies in deep water, about half a mile S.W. of the entrance, which is marked by two *buoys*: one, painted *red*, lies about $1\frac{1}{4}$ mile N.W. $\frac{1}{4}$ N. from the lighthouse, and the other, painted *black*, lies about 2 cables farther northward. Within these the channel is marked by *red* buoys to starboard, and *black* buoys to port, in entering. A *beacon* stands on the East side of *Westham Island*, $2\frac{1}{4}$ miles within Garry Point, and two *spar* buoys mark *Woodward Slough*, eastward of the beacon.

The least depth at low water, up to New Westminster, is 9 ft., and 17 to 19 ft. at high water springs, about $5\frac{1}{4}$ miles within the entrance, or 1 mile within Garry Point. The following directions were issued in 1895, but must be used with caution, as changes may occur.

Page 463.—Directions.—Having made out the Sand Head lighthouse, and the bell buoy, steer to pass between the outer buoys, and then to leave the *black* buoys within close on the port hand, and the *red* buoys close on the starboard hand, up to Garry Point. Keep within 1 cable of that point, and of the shore south-eastward, nearly as far as English's cannery, which is about 9 cables south-eastward of Garry Point. Then bring that cannery to bear N.N.W. astern, and with it on that bearing cross over to the *Westham Island* bank, keeping about 1 cable off up to the beacon on that island. Thence alter course to the eastward, and pass between the two *spar* buoys at the entrance of *Woodward Slough*. Steer in mid-channel, rather on the northern side of the river, through *Woodward Slough* and *Gravesend Reach*; thence southward of *Annacis Island*, keeping towards the South shore through the first bend, then in mid-channel to New Westminster, where vessels lie moored, in a depth of $6\frac{1}{4}$ to 7 fathoms, sand and mud.

Tides.—The time of high water is 2 or 3 hours later at New Westminster than at the entrance of the river. In September, 1890, the ebb ran 3 to 4 knots, flood 1 to $1\frac{1}{4}$ knot, the water being quite fresh.

NEW WESTMINSTER contained 6,641 inhabitants at the census in 1891. It is connected with the Canadian Pacific Railway, and on the opposite side of the river is *Liverpool*, which is connected by railway with Seattle.

Page 464.—North Fork, the northernmost approach to Fraser River, is nearly dry at low water, and only navigable by small craft, with local knowledge. It is marked by single pile *beacons*, the outermost being in lat. $49^{\circ} 14' N.$, long. $123^{\circ} 13\frac{1}{4}' W.$, outside which the channel is lost in the sands of *Sturgeon Bank*.

Page 465.—**BURRARD INLET.**—Atkinson Point Lighthouse is 41 ft. high; the light is elevated 95 ft., and is obscured when bearing eastward of N. 72° E. In foggy weather, a *Horn* sounds a blast of 8 seconds, separated by intervals of 1 minute.

Spanish Bank.—A pile beacon, surmounted by a red ball, stands on the northern edge. There is 8 fathoms at 100 yards northward of it.

Pages 466, 467.—**First Narrows** have eddies when the tidal streams are running strongly, necessitating caution, especially with vessels of deep draught. Two pile beacons mark the edge of the drying bank on the North side, about 1 mile apart; they are painted black, and surmounted by a white cone, 10 ft. high, base upwards. About midway between these beacons are two others, one on each side of the water supply pipe which here crosses the Narrows.

Brockton Point Light.—On the mast at the Signal Station is shown a fixed light, elevated 51 ft., and visible 8 miles; it is bright, with a red sector of 30° over Burnaby Shoal, between N. 83° E. and S. 67° E. In foggy weather, a *Bell* is struck once every 25 seconds.

Parthia Shoal, with 21 ft. least water, is 3½ cables in extent, East and West, within the 5-fathoms line, and the eastern edge lies 2½ cables N.W. ¼ W. from the eastern extreme of Brockton Point. Two black mast beacons, 30 ft. high, have been erected on Brockton Point, to lead clear South of this danger, in not less than 5½ fathoms. In line they bear E. by S. ¼ S., 65 yards apart. Two mast beacons, each bearing a white drum, stand on the South shore, to show its eastern and western limits.

Burnaby Shoal is marked by a red spar buoy, in 12 ft., on its N.E. part.

Tides.—From observations at Vancouver, in April, May, and June, it was found to be high water, on full and change, at 7^h, and the rise 11 feet. The streams turn at high and low water by the shore. There is a large diurnal inequality. In summer, the higher tides occur at night, and in winter during the day.

Pilots.—A small pilot boat cruises off the entrance to Burrard Inlet, but sometimes anchors near Spanish Bank, or in Skunk Cove, half a mile eastward of Atkinson Point.

VANCOUVER is now a considerable town, containing 13,685 inhabitants at the census in 1891, increased to over 20,000 at the present time, and is rapidly growing in importance. The Canadian Pacific Railway was completed in 1887, and there are now lines of steamers running to China and Japan, Australia, Alaska, and the various coast ports. It is calculated that by this route the distance from England to Yokohama is shorter by 1,026 miles than by way of San Francisco. It carries on a large timber trade, having extensive sawmills. The railway wharves have depths of 24 to 26 ft. alongside at low water. Provisions and supplies are plentiful, including coal and water, the latter being obtained from Capilano Creek, on the North shore of the First Narrows, the pipe passing across on the bottom. At present there are no facilities for docking, but vessels can be beached on the North side of the harbour, for painting, &c. Steamtugs can be had, if required.

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Page 468.—Gabriola Reefs.—The *beacon* has been destroyed, and will not be replaced. The *buoy* lying off the N.E. end is a *black can*, with *staff* and *square cage*.

Page 469.—Entrance Island Light now shows *red* over Gabriola Reefs, between East and S. 83° E. (7°). In foggy weather, a *Horn* sounds a blast of 8 seconds, with intervals of 45 seconds.

A *red can buoy* lies in 9 fathoms, about 1 cable south-eastward of the South end of the rocky ledge E.S.E. of *Lighthouse* or *Snake Island*.

Pages 470-471.—NANAIMO now contains about 5,000 inhabitants, and is connected with *Victoria*, 73 miles distant, by railway, and with *Vancouver* and other coast ports by regular lines of steamers. About 320,000 tons of coal were raised here in 1896. A wharf extends 150 yards from the western part of *Gallows Point*, into 4 fathoms water, and other wharves have been constructed, with 28 ft. alongside at low water. The prison, on the western side of *Newcastle Island* passage, is a conspicuous building. Fresh meat and stores may be obtained here, and water is abundant and good. Small repairs could be executed, and vessels can be safely beached, if necessary. Seamen are admitted into the hospital. Care is necessary in entering the harbour, as the tidal streams sometimes run strongly. Pilotage is compulsory. Vessels lie at anchor off the town in 5 fathoms.

Lights.—On the South side of the entrance channel, about 2 cables S.S.E. from *Gallows Point*, is a black pile *beacon*, on which is shown a *fixed red light*, elevated 10 ft., and visible 2 miles, but it may not be possible to exhibit it in bad weather.

On the northern end of *Middle Bank* is a black pile *beacon*, bearing a *fixed bright light*, elevated 8 ft., and visible 2 miles.

Beacon Rock is now marked by a black stone *beacon*, bearing a *staff* and *ball*, rising 10 ft. above high water. *Nicol Rock*, $1\frac{1}{2}$ cable E.S.E. from *Beacon Rock*, has been dredged to a depth of 16 ft. at low water; a tide-gauge stands on piles close southward of it.

Buoys.—A square flat *red buoy*, with *staff* and *ball*, lies on the North side of the entrance, at $1\frac{1}{2}$ cable S.E. by S. from *Gallows Point*. A *black buoy*, with *staff* and *triangle*, lies on the South side of the harbour, at $2\frac{1}{2}$ cables S. $\frac{1}{2}$ W. from *Gallows Point*. A *red buoy*, with *staff* and *ball*, lies on the South side of *Satellite Reef*, 3 cables W. by S. $\frac{1}{2}$ S. from *Gallows Point*. A *black buoy*, bearing a *staff* only, lies on the South side of *South Channel*, 4 cables S. by W. $\frac{1}{2}$ W. from *Gallows Point*, and a dolphin stands about 1 cable to the S.W. of it.

A *red buoy*, with *staff* and *ball*, lies to the S.E. of *Middle Bank*, over 4 cables S.W. by S. from *Gallows Point*, and a *red spar buoy* lies three-tenths of a cable West of it. A *black buoy* lies on the rock eight-tenths of a cable N.W. of *Beacon Rock*. A *black buoy*, with *staff* and *triangle*, lies on the West side of the harbour, $2\frac{1}{2}$ cables N.W. $\frac{1}{2}$ N. from *Beacon Rock*.

Pages 471-472.—**DEPARTURE BAY.**—The coal-mining town of *Wellington* is connected with Nanaimo by railway, and now contains about 2,000 inhabitants. In 1896, nearly 340,000 tons of coal were raised here. Capt. Walbran, of the government steamer *Quadra*, states that the passage to and from the wharves, between Double Island and Black Rocks, is perfectly safe and free from danger. The passage northward of Black Rocks and Jesse Island is also good and safe, care being taken to avoid a 2-fathoms patch lying about 100 yards eastward of the easternmost Black Rock. Depths of 7 and 8 fathoms are found close along the North shore of Double Island and Jesse Island. At 1 cable off the East end of the easternmost Double Island is a depth of 2 fathoms, marked by kelp.

A rock, with 2 ft. over it at low water, and steep-to, lies between Jesse Island and Horsewell Bluff, with the latter bearing N. by W. $\frac{1}{2}$ W., and the western bluff of Jesse Island S.W. by S.

Buoyage.—*Clarke Rock*, nearly in the centre of Inner Channel, is marked by a *black spar* buoy on its eastern edge. Another marks the eastern side of the entrance of Inner Channel.

In 1895, the following buoys were stated to exist:—A *red* buoy, with staff and ball, marking the reef off Newcastle Island, on the S.E. side of the bay. A *red can* buoy on the edge of the shoal on the North shore, inside Black Rocks. A *black can* buoy eastward of the reef off Jesse Island. A *red can* buoy off Horsewell Bluff reef. A *black spar* buoy on the South side of West Rocks.

Page 473.—**Northumberland Channel.**—*False Narrows* are intricate and dangerous, with a depth of about 3 fathoms at high water. The channel is marked by three single pile *beacons*, and three *spar buoys*.

Page 474.—**Nanoose Harbour.**—A 16-ft. rock lies in the entrance, $2\frac{1}{2}$ cables N. $\frac{3}{4}$ E. from Entrance Rock. A 5-fathoms rock lies over $1\frac{1}{2}$ cable E. by N. $\frac{1}{2}$ N. from the 16-ft. rock.

Page 475.—**Qualicum River.**—A *black can* buoy lies in 5 fathoms, about one-third of a mile northward of the entrance.

Page 476.—**YELLOW ISLAND Lighthouse** is a square white wooden building, 55 ft. high, standing on the summit, and showing a *flashing bright* light, elevated 120 ft., and visible 17 miles: a group of *three flashes*, with intervals of 15 seconds between them, followed by an interval of 30 seconds. The light is visible in all directions, except where obscured by trees and the high land of Denman and Hornby Islands.

To clear *Maple Bank*, the light should not be brought to bear northward of E. by N. $\frac{1}{2}$ N., and, when passing Hornby Island, the light bearing S.W. leads clear of the reefs southward and eastward of that island. The passage between Yellow Island and Denman Island has only 2 ft. water in it.

Page 476.—**BAYNES SOUND.**—A pile *beacon* stands in 18 ft. water, on the northern edge of the bank extending off *Maple Point*; it is surmounted by two white discs, 7 ft. in diameter, rising 16 ft. above high water.

Kelp Reef, off *Reef Bluff*, on the eastern side of the entrance, is marked

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by a *red nun buoy*, in 6 fathoms, $1\frac{1}{2}$ mile W. by S. from Yellow Island lighthouse; and another lies in 8 fathoms, off the West spit, three-quarters of a mile farther to W. by S.

Deep Bay.—In 1893, the U.S. vessel *Albatross* anchored in $10\frac{1}{2}$ fathoms, shutting out Yellow Island light by the clump of trees next to the main body of trees on Maple Point.

Page 477.—**Fanny Bay.**—A pile beacon stands in 12 ft., on the outer extremity of *Base Flat*; it is similar to that on Maple Point (see page 18).

A *red spar buoy* lies in $3\frac{1}{2}$ fathoms, on the end of the reef extending off *Village Point*.

Union Bay is about $4\frac{1}{2}$ miles to the N.W. of Fanny Bay, on the western side of the sound, and just southward of *Union Spit*, which is marked by a pile beacon, bearing a disc, in 18 ft. water, on its extremity. There are coal stores at Union Bay, connected with the mines by railway, and the principal wharf reaches into 6 fathoms at low water, where vessels of any size can lie alongside. There is good anchorage in 10 or 11 fathoms, mud, off the South end of the wharf. A few fresh supplies could be obtained.

Pages 476, 477.—**Kelp Bar** is now marked by two single *red pile beacons*, in $3\frac{1}{2}$ fathoms, each bearing a *triangle*, rising 9 ft. above high water. They are 533 yards apart, at the East and West limits of the shoalest ground, and by passing southward of them, on a S. by W. $\frac{1}{2}$ W. or N. by E. $\frac{1}{2}$ E. course, a vessel will cross the bar in a least depth of 12 ft. at low water. The *White Beach* leading marks, when in line, appear like a St. Andrew's cross, and lead in the same depth southward of the beacons.

In 1895, it was reported that there was much shoaler water, at half a mile S. by E. $\frac{1}{2}$ E. from the western bar beacon, than shown on the chart, depths of 9 to 15 ft. being found.

Page 478.—**Port Augusta.**—A few fresh supplies may be obtained at the village of *Comox*. On the S.W. extremity of *Goose Spit* is a wooden pyramid beacon, 32 ft. high, painted white above and black below. A single black pile beacon, bearing a *ball*, stands in 15 ft. water, near the N.E. extremity of the flat extending from *Grassy Point*.

Page 480.—**Kuhushan Point** is very low at its extremity, the trees being 300 yards within.

Page 480.—**Cape Mudge.**—The first of the flood stream sets strongly to the eastward, over the shoal ground south-eastward of the cape.

Page 481.—**Sisters Rocks**, to the S.W. of *Jasqueti Island*, are three in number, and on the eastern and largest stands a black wooden pyramid beacon, 42 ft. high.

Pages 482-483.—**Shoal Channel.**—Two rocks, drying 3 ft. at low water, lie on the West side of the channel, the northern one being nearly 3 cables E. $\frac{1}{2}$ S. from the extremity of the wharf at Gibson's Landing.

Pages 483-484.—**Rock Point** is the point next northward of Gower Point, and a boulder reef extends half a mile off shore just eastward of it. A rock, drying at low water, lies $2\frac{1}{2}$ cables off shore, bearing N.E. $\frac{1}{2}$ N. from

White Islet. A similar rock lies 2 cables off shore, bearing N.W. from the rock off the North end of the western Trail Islet. A shoal extends 3 cables off *Welcome Point*, the rounded point E.N.E. of *Merry Island*.

Welcome Pass is the channel between *Merry* and *Thormanby Islands*. A rock, drying at very low springs, is said to lie in the fairway, about 8 cables N.E. of *Bare Islet*, and others may exist.

Page 484.—*Texada Island.*—Some deposits of gold, silver, and copper ore are worked on the East coast.

Page 485.—*MALASPINA STRAIT.*—*Buccaneer Bay*, formed between the northern ends of the two *Thormanby Islands*, affords good sheltered anchorage at its head, in 15 fathoms. Shoal water extends half a mile northward from both islands, and on the East side of the entrance is *Tattenham Ledge*, with a rock drying at low water on its S.W. side, about $3\frac{1}{2}$ cables N.W. by W. from *Derby Point*.

Page 486.—*Pender Harbour.*—Several rocks have recently been found in the approaches, as shown on the chart.

Page 487.—Two rocks, of 3 and 4 fathoms, lie about 2 miles E.S.E. of *Cape Cockburn*. Opposite the 3-fathoms or northern rock, which is $1\frac{1}{4}$ mile off shore, is a large white cross on a conspicuous boulder, which in line with a whitewashed tree trunk would lead over it.

Pages 487-488.—*Harwood Island.*—At 1 mile W.S.W. of the South end is *Bare Islet*, 30 ft. high. On the mainland, to the N.E. of *Harwood Island*, is the settlement named *Sliammon*.

Page 488.—*Savary Island.*—A reef, half a mile in extent, W.N.W. and E.S.E., partly drying at low water, is reported to lie about 3 miles S. $\frac{1}{4}$ W. from the S.E. extreme of the island. All the area within a line from *Bare Islet* towards the West point of *Savary Island* is said to be foul.

Page 488.—*Lund* is a settlement, with a post-office, on the coast south-eastward of *Ragged Islands*, in lat. $49^{\circ} 59' N$.

Page 488.—*Hernando Island.*—A dangerous small rock, awash at low water, lies N. $\frac{1}{4}$ W. from the bluff of *Hidalgo Point*, on the North side of the island, with no safe passage between.

Pages 490-491.—*CORTES ISLAND.*—A red can buoy lies in $14\frac{1}{2}$ fathoms, off the S.W. end of the reef extending from *Reef Point*. In 1895, this dangerous reef was said to extend farther than shown on the chart. *Manson Bay*, eastward of *Mary Island*, is clear of danger, and has a store and post-office at its head. The narrow channel between the North end of *Mary Island* and the shore has a small rock nearly in mid-channel, marked by a pole beacon.

Whaleton Bay, on the West coast of *Cortes Island*, about 1 mile northward of *Mary Island*, affords good anchorage for small vessels in 5 fathoms, northward of a pole beacon on a rock near the head of the bay, on which a light is shown when the mail steamer is expected. Here is a small settlement, with a wharf and post-office. In the middle of the entrance is a small rock, with 8 ft. over it, and steep-to.

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Page 495.—Gowlland Harbour.—Exercise caution in entering, as the tidal currents run swiftly between Sheep and Gowlland Islands.

Warspite Rock, a dangerous pinnacle with only 4 ft water over it, lies off the western shore, at $1\frac{1}{2}$ cable N.E. of Middle Point, nearly midway between Race and Orange Points.

Page 496.—SEYMOUR NARROWS.—Tides.—In 1894, the Canadian Government issued the following remarks:—The tides in the inland channels of British Columbia are affected by the winds, the highest tides occurring at certain times when neap tides are expected, at about the first and last quarters of the moon, so that no tide table can be depended upon with any degree of accuracy.

The rule governing the tides of the Pacific coast is applicable to all the inland channels of British Columbia; that is, there are usually two high and two low waters in each day, locally termed the long and the short run in or out. Owing to this peculiarity some difference of opinion exists as to the time of high water at Seymour Narrows, which may be explained thus:—It is high water, on full and change, of the short flood at 3^h, and of the large or long flood at from 4^h to 5 $\frac{1}{2}$ ^h. Usually it is high water during the day in winter, and at night in summer. During May, June, and July, also in November, December, and January, there is only one real high and low water in each day, the water rising by the shore, while in the channels the stream runs ebb.

On four occasions in Seymour Narrows, at about full and change, in May and June, the water was observed to be perfectly still, and there is reason to believe that the slacks of the highest tide at this season continue for at least 30 minutes. As the time of high water approaches in Seymour Narrows, the flood tide runs comparatively smoothly from the North until it arrives off Maud Island, when the stream, deflected by the land to the southward, turns to the S.E., causing, unless close to slack water, most dangerous whirlpools and overfalls near the South shore of Maud Island, and also about $1\frac{1}{2}$ mile farther on, near mid-stream, opposite to Race Point. With the ebb tide the stream runs comparatively smoothly from the South until again off Maud Island, where it turns to the northward through the Narrows, and becomes a rapid and dangerous race, with the water swirling in all directions. The tendency of the current is to keep a ship off the shore when passing through the Narrows.

The position of *Ripple Rock* will always be seen when the current is running, and is easily avoided by keeping along the eastern shore of the Narrows.

There is no danger in passing through Seymour Narrows at the proper time, slack water or near thereto, but no vessel should attempt to pass when the tide is running strong.

Directions.—When going through the Narrows, bound North or South, ebb or flood tide, keep along the eastern shore, passing the S.W. point of Maud Island about 200 yards distant. When bound South, and going with the last of the flood, after passing the S.W. point of Maud Island, follow the main current well over to the South shore before turning eastward, and

do not attempt to go round Maud Island closely, as just East of this point, on the flood tide, are the dangerous whirlpools previously mentioned.

Plumper Bay has a rocky 14-ft. shoal near the edge of the shoal ground in its S.E. part.

Hole in the Wall, or *Okishollow Channel*, is the narrow passage northward of *Granite Point*, which thence extends across to the East coast of Valdes Island, one branch debouching opposite the entrance of Bute Inlet, and another runs into Hoskyn Inlet at Surge Narrows. It is frequented only by small steamers for lumber.

Page 497.—**Cardero Channel**.—Some rocks have recently been found in this channel, as shown on the chart.

Page 497.—**Chatham Point**.—A rock, with about 15 ft. over it, is reported to lie about 2 cables N.E. $\frac{1}{4}$ N. from Beaver Rock.

Page 499.—**Johnstone Strait**.—In April, 1898, the ship *Richard III.*, drawing 19 $\frac{1}{2}$ ft., was reported to have struck a rock on *Ripple Shoal*.

Page 502.—**Gilford Island**.—In 1891, a rock, drying at low water, was reported to lie about 1 $\frac{1}{2}$ cable W.N.W. of *White Point*, on the N.W. coast, in lat. 50° 46 $\frac{1}{2}$ ' N., long. 126° 28 $\frac{1}{2}$ ' W.

Page 504.—**Nimkish River**.—A red spar buoy lies in 3 fathoms, on the northern extreme of the bank.

Port McNeill.—A red spar buoy lies in 5 fathoms, off the eastern extreme of Ledge Point reef.

Page 506.—**Beaver Harbour**.—*Fort Rupert* has been abandoned by the Hudson Bay Company, who have withdrawn their trading station here. A 5-ft. rock lies 1 $\frac{1}{2}$ cable E. by S. $\frac{1}{4}$ S. from the northern point of Round Island, and at 100 yards S.S.W. of this rock is another with 12 ft. over it.

Page 517.—**SMITH SOUND**.—In 1897, it was announced that a steamer had struck on a 6-ft. rock in the channel between Central and Sound Islands, supposed to be on the eastern extremity of a reef extending 4 cables E.N.E. from Central Island.

Smith Inlet is reported by Capt. J. T. Walbran, of the steamer *Danube*, to have deep water, and no known dangers within. On the southern side of the entrance are Round and Dot Islands, both wooded. About 6 miles up, on the southern shore, is *Cape Anne*, eastward of which is *Quashela Bay*, visited by Vancouver, which is said to afford confined but safe anchorage in its southern bight, in 22 fathoms. A rock, drying at low water, lies 1 cable E. by N. $\frac{1}{4}$ N. from Cape Anne. On the northern shore, opposite Cape Anne, is a land-slide, and a thickly-wooded point facing westward, which has the appearance of a cone from a vessel going up the inlet. The vessels of the Hudson Bay Company anchor in 45 fathoms, rocky bottom, with the stern warped to trees, off the entrance of an inlet 1 $\frac{1}{2}$ mile eastward of Cape Anne; this anchorage is bad. A salmon cannery is situated about half a mile up the inlet, from which scows bring cargo down to vessels at the entrance.

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Pages 517-518.—Rivers Inlet.—A rocky 4-fathoms patch, with 20 fathoms close around, lies in the southern entrance, at 8 cables S.W. $\frac{1}{2}$ W. from Zero Rock. According to Capt. J. T. Walbran, the inlet runs about 12 miles in a northerly direction, and then 10 miles north-eastward to the mouth of the River Wannock. In the entrance lies *Zero Rock*, of white limestone, 15 to 20 ft. high. *Black Rock* is low and smooth, and 3 or 4 ft. high, with foul ground between it and the island to the northward. Vessels should pass north-westward of Zero Rock, and south-eastward of Black Rock, about 1 cable off each, in deep water.

Schooner Passage, the entrance to which is on the western shore, about 10 miles up the inlet, and westward of Walbran Island, has deep water, with low and densely-wooded shores. It has a breadth of about 2 cables, and is frequently used by the Hudson Bay Company's steamers, but it is not suitable for vessels more than 240 ft. long. There is a sunken rock at the western entrance of the passage, to avoid which sharp turns are necessary; and the northern shore should be kept very close on board.

Good anchorage is reported in the north-western bight, in 10 to 20 fathoms, where Rivers Inlet turns to the eastward. *Wannock* cannery is on the northern shore, about 2 miles eastward of this bight. At the mouth of the *River Wannock* is the village of *Oweekayno*, and a saw-mill, cannery, and a wooden church are on the South side. The water is too deep for anchorage off *Oweekayno*. The least water on the bar of the *Wannock* is 9 ft. at low water abreast the church. There is a wharf at the saw-mill, with a depth of 12 ft. alongside. A mail steamer calls at the establishments in Rivers Inlet once a month.

Page 519.—Fitzhugh Sound.—*Swan Rock* is a dangerous rocky patch, not marked by kelp, lying about half a mile to the S.E. of *Addenbrooke Point*; it is about $2\frac{1}{2}$ cables in extent, E. by S. and W. by N., with 7 to 12 ft. over it.

Pages 522-523.—Lama Passage.—*Walbran Rock*, with 12 ft. over it, and steep-to, lies $2\frac{1}{2}$ cables E. by S. $\frac{3}{4}$ S. from the S.E. extreme of *Pointer Island*, on the South side of the entrance. A rock awash lies close to the northern shore, bearing about W. by N. from *Serpent Point*.

McLaughlin Bay.—The rock reported to lie about 6 cables N.N.W. of *Napier Point* has been searched for in vain.

Page 522.—Dean Canal has the village of *Kimsquit* at its head, at 2 miles above which the inlet is contracted to about 1 mile in width by two low spits, and beyond these, on the East shore, is a bay, where vessels may lie in 40 fathoms, off a pebbly beach.

Pages 528-529.—Kynumpt Harbour.—The 10-ft. rock reported to lie 2 cables S.W. of *Low Island*, searched for unsuccessfully by the officers of H.M.S. *Heroine*, in 1883, was found, in 1895, to lie more than 2 cables S.W. by W. $\frac{1}{4}$ W. from the S.E. extreme of *Low Island*, and has 6 ft. over it at low water.

In 1891, a *spar buoy*, painted in red and black bands, was placed in 9 ft.,

close westward of the shoalest part of *Dall Patch*, but a later account states that it lies in $2\frac{1}{2}$ fathoms, on the S.E. side. In 1893, the steamer *Alki*, drawing 17 ft., struck at low water on a rock said to lie a short distance northward of *Dall Patch*.

Pages 535-536.—**GRENVILLE CHANNEL**.—In 1897, Capt. J. T. Walbran, of the steamer *Quadra*, reported that for 4 miles north-westward of Devonport Point the western shore is fronted by foul ground to about 1 cable off, or less. The eastern shore is bold. He also states that from Klewnugget northward the eastern shore is not accurately charted, and several islands and openings are not shown. A dangerous timber snag was also found in a depth of 16 fathoms, at 2 miles E. by S. $\frac{3}{4}$ S. from the South end of Bloxham Island.

Page 540.—**Port Essington** has three dangerous sunken rocks in and near the fairway. The northern one, drying 2 ft. at low water, lies nearly $2\frac{1}{2}$ miles N.E. by N. from Veitch Point, with the northern point of Village Island, at the West side of Ecstall River entrance, bearing S.E. $\frac{1}{2}$ E. The central and most dangerous rock dries 1 foot, nearly $2\frac{3}{4}$ miles N.E. $\frac{3}{4}$ N. from Veitch Point, and is marked by a *black spar buoy*, lying on the edge of the shoal ground northward of Village Island. The southern rock, awash at low water, lies nearly $2\frac{1}{2}$ miles N.E. of Veitch Point. The settlement of Port Essington is on the West side of Ecstall River entrance, and on the East side of the river is *Balmoral*, where there is a large salmon cannery, where steamers call regularly.

Page 546.—**Anger Island** is separated from the coast of Pitt Island by a narrow and intricate channel, which is used by small steamers engaged in collecting salmon for the Skeena River canneries.

Page 549.—**Beaver Passage**.—The northern and smaller *Connis Rock* is a wooded islet.

Page 549.—**Kitkatlah Inlet**.—See Addenda for page 557.

Page 550.—**Kitson Islet**, off the mouth of North Skeena Passage, has shoal ground, of 6 to 8 ft., extending about 6 cables south-eastward from its southern point. The passage between the islet and Leer Point is only navigable by boats.

Page 551.—**METLAH-CATLAH BAY**.—A *black spar buoy* lies in $3\frac{1}{2}$ fathoms, on the S.E. extreme of the reef extending South of *Tugwell Island*, at 6 cables E.S.E. of Dawes Point. A *red can buoy* lies in 6 fathoms, half a cable westward of *Alford Reefs*. A small stone *beacon*, bearing a staff and cross pieces, rising 8 ft. above high water, stands on the extremity of the rocky ledge extending $1\frac{1}{2}$ cable N.W. of *Shrub Islet*. A *black spar buoy* lies close eastward of *Kelp Rock*, and another in 10 ft., on the extremity of the reef $1\frac{1}{2}$ cable eastward. Another lies in 6 ft., 2 cables S.S.W. of *Mission Point*.

Page 552.—**Hodgson Reefs** are marked by a *red can buoy*, lying in 5 fathoms, off their S.W. extreme, at nearly $1\frac{1}{2}$ mile W. $\frac{1}{2}$ S. from Ryan Point.

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Page 553.—**BIG BAY**.—There is confined anchorage in 4 fathoms, southward of Swallow Island. On the banks of the river, eastward of the island, is the village named *Georgetown*, where is a small iron shipbuilding yard. The mail steamers call here.

Page 553.—**Sparrowhawk Rock** is marked by a buoy, painted in black and red bands, lying in 2 fathoms.

Page 554.—**PORT SIMPSON** is the nearest harbour on British territory for vessels bringing passengers and cargo for the upper reaches of the Yukon River, via the Stickeen River. These have now to be transferred into river steamers at Fort Wrangel, on United States territory, as it would not be safe for river boats to navigate the open waters between. A pier extends from the fort to low-water mark.

Pages 556-557.—**STEPHEN ISLAND**.—*Butlers Cove*, on Stephen Island, is an excellent and secure anchorage for small vessels, being clear of danger, and can be entered in the worst weather. The water is deep, and the shores steep-to, there being sheltered anchorage in 12 fathoms, mud, a little above the rock on the North side. There is a fishery station here. *Skiakl Bay*, about 1 mile to the N.W. of White Cliff Point, is full of rocks.

Page 557.—**EDYE PASSAGE**.—In 1897, Capt. J. T. Walbran reported that there is no passage from the northern end of *Canoe Passage*, or *Kitkatlah Inlet*, into Eddy Passage, there being an isthmus $2\frac{1}{2}$ miles wide. The inlet is a spacious sheet of water, with numerous islets in it. At 5 miles W. $\frac{1}{2}$ N. from the village of *Kitkatlah* is the entrance of *Freedman Pass*, which thence trends $2\frac{1}{2}$ miles to S.S.W., only 100 yards across in its narrowest part, but widening to 1 mile at the seaward end. This passage is intricate, with strong tidal currents, but is used by steamers engaged in the halibut fishery.

Wallace Rock, with 8 ft. over it, and marked by kelp, lies about $1\frac{1}{2}$ mile W. by N. from Seal Rocks. Broken water is also stated to have been observed much nearer to Warrior Rocks than to Wallace Rock. The passage South of Seal Rocks is safe, and also that northward of the Warriors, but vessels are advised not to pass between.

Page 558.—**Refuge Bay** has a fishery settlement on its West side, with a cannery and a store. The wharf reaches to low-water mark.

Page 572.—**Houston Stewart Channel**.—*Quadra Rocks* form a small rocky patch, with 6 to 14 ft. over it, the western extreme lying $5\frac{1}{2}$ cables N. $\frac{1}{2}$ W. from Hornby Point. In May, 1892, the rise at springs was observed to be 16 feet.

Page 579.—**SKIDEGATE INLET** has some deposits of coal on both shores. A red buoy lies in $3\frac{1}{2}$ fathoms, on the North side of *Dead Tree Point Channel*, at 7 cables S. by W. from Inner Bar Rock. *Danube Rock*, in the fairway of the inner part of the inlet, has about 4 ft. over it, and lies 3 cables N. by E. $\frac{1}{2}$ E. from the N.E. point of Triangle Islet.

Page 580.—**Skidegate Channel**.—See Addenda for page 586.

Page 584.—Virago Sound.—In July, 1896, the village of *Kung* was found to be entirely deserted, and no pilots could be obtained by firing a gun at the outer anchorage.

Page 585.—North Island.—A rock, on which the sea breaks heavily, lies about 8 miles N.W. by W. from the N.W. point of the island.

Page 586.—Rennell Sound.—A rock, on which the sea breaks heavily, lies in about lat. $53^{\circ} 26' N.$, long. $132^{\circ} 49' W.$

Pages 586-587.—Skidegate Channel.—In 1896, an island, about 2 miles in circumference, was observed to lie about 4 miles West of the South point of the entrance. Foul ground extends 1 mile westward of the latter point, and at half a mile eastward of the island a rock was seen breaking heavily. On the North side of the channel, about 2 miles within the entrance, is a good harbour with secure anchorage.

Page 587.—Moore Channel.—A heavy breaker has been observed in the entrance, about $1\frac{1}{4}$ mile N.N.W. of Cape Henry. In 1896, Capt. Meyer, of the steamer *Danube*, stated that when steering along the shore between Cape Henry and San Christoval Mountain (in lat. $52^{\circ} 29' N.$), no large openings were seen, as marked on the chart, except Tasoo Harbour.

Page 588.—Tasoo Harbour is easy of access for steamers, and well sheltered, but no good anchorage was found for the *Danube*; she lay 1 cable off a conspicuous gravelly beach on the North shore, eastward of three rocky islets.

Pages 590-594.—ALASKA.—The population of this vast territory, whose shore-line has an extent of about 26,500 statute miles, was estimated at only 32,052 at the census in 1890, of whom 4,298 were whites. Its wealth and resources consist mainly of furs, fish, minerals, and timber, the fur trade being still by far the most important. Lignite coal has been discovered in various parts. The best timber is found between the S.E. boundary and Prince William Sound, and several sawmills are now at work. In 1891, United States customs officers were stationed at Mary Island, Wrangel, Juneau, Kodiak, Sand Point (Schumagin Islands), and Unalaska.

The United States Government has surveyed the more frequented parts of the coast and islands, the great extent and intricacy of the coast-line, and the innumerable off-lying islands and rocks, causing this work to be very slow and tedious. Every care must be exercised when navigating in this region, as previously remarked in page 1 of the Addenda.

Pages 593, 595.—Tongas is no longer a military post, but there is an Indian village here.

Page 595.—BEHM CANAL is navigable by the largest vessels. There is a custom-house on the N.W. side of *Mary Island*, off the eastern entrance to the Canal.

Page 596.—Burrough Bay has a salmon cannery at its head, near the mouth of *Unuk River*.

Page 597.—Yess or McDonald Bay, a long narrow inlet, 5 miles westward of Bell Island, has a salmon cannery near its head.

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Page 597.—On the North side of *Naha Bay*, on the western coast of Revilla Gigedo Island, is the village of *Loring*, where there is a large salmon cannery and a post-office, situated in about lat. $55^{\circ} 36' N.$, long. $131^{\circ} 38' W.$

Page 598.—**TONGAS NARROWS and Approaches.**—See Addenda on page 2. On the West side of the channel, opposite *Alava Point* (page 595), are some off-lying islets and rocks, the easternmost known as *Hog Rocks*. A *black can buoy* lies in 12 fathoms, close eastward of *Hog Rocks*.

Spire Island Reef, off the northern side of Annette Island, is marked by a *black can buoy*, in 7 fathoms, off its N.E. extreme.

Cutter Rocks, lying off Mountain Point, opposite the northern extreme of Annette Island, are marked by a *mast beacon*, bearing a *barrel*, painted in *black and white bands*. In 1895, kelp, with the appearance of shoal water, was reported 1 mile W.S.W. of the beacon.

California Rock, lying off the North side of Pennock Island, in the southern approach to the Narrows, has a *buoy* 1 cable north-eastward of it.

Idaho Rock is marked by a *red nun buoy*, lying in 20 ft., over 6 cables N.W. $\frac{3}{4}$ W. from the East end of Pennock Island.

Northward of the N.W. end of Pennock Island is the village of *Kichikan*, with a post-office.

Page 598.—**DUKE OF CLARENCE STRAIT.**—*West Devil Rock* is in lat. $54^{\circ} 39\frac{1}{2}' N.$, long. $131^{\circ} 36' W.$ This locality was examined by the surveyors in 1897, when broken ground, with 10 fathoms least water, was found to extend $1\frac{1}{2}$ mile North of the rock, and is said to break in heavy weather.

Page 599.—**Felice Strait.**—*Point Percy* is the westernmost of a group of islets lying in the passage between Duke and Annette Islands. This strait has several reefs in it. *Wallace Reef*, off the South coast of Annette Island, and nearly three-quarters of a mile S.W. by W. from Snipe Islet, is marked by a *red nun buoy*. A similar *buoy* marks *Ajax Reef*, 2 miles farther south-westward.

Nichols Passage divides Annette Island from Gravina Island, and has numerous islets and reefs in its southern part, especially off *Port Chester*, on the western side of Annette Island, where there is an Indian village and mission station, the *New Metlahkatlah*, with a salmon cannery, saw-mills, stores, &c. *Kelp Rocks*, lying in mid-channel off Port Chester, are marked by a *red nun buoy*, in 10 fathoms, off their N.E. side. At $1\frac{1}{2}$ mile to E. by S. $\frac{1}{2}$ S. from this buoy is a *black can buoy*, in 10 fathoms, off the extremity of the reef extending from *Gull Islet*, which lies westward of Village Point. *Walden Rocks*, lying in mid-channel, in the northern entrance of Nichols Passage, were marked by a *mast beacon*, which was removed in 1897.

Page 601.—*Point Highfield* has a fish cannery on it. A 6-ft. pinnacle rock, $3\frac{3}{4}$ cables N.E. by E. from the point, is marked by a *red nun buoy*, lying in 16 feet.

Etoline Harbour is now known as Wrangel Harbour.

WRANGEL has lately risen to some notoriety, being situated at the mouth of the Stikine River, one of the main approaches to the Yukon River goldfields. Here ocean-going vessels transfer their passengers to the river steamers, and some controversy has arisen with the United States customs authorities, but the navigation of this river is free by treaty for Canadian as well as American vessels.

Page 602.—**STIKINE or STICKEEN RIVER**, as stated previously (in page 1 of the Addenda), is a favourite route for many to the goldfields, being all in Canadian territory, and is also likely to be the most frequented on the completion of the railway. During the winter the river is frozen over, but from May to the middle of November it is navigable for vessels drawing 4 ft. as far as *Telegraph Creek*, a distance of 138 miles from Fort Wrangel, and at 12 miles below Telegraph Creek is the settlement of *Glenora*. A railway is being constructed from Glenora to *Lake Teslin*, about 140 miles distant, whence ordinary river vessels and boats can reach the Yukon; it is to be completed in the autumn of 1898, and is not likely to be obstructed by snow in winter.

Garden roots and vegetables are raised on *Farm Island*, at the entrance of the river, and salmon and wildfowl abound in the surrounding region.

Page 602.—**Wrangel Channel or Narrows** is only available for vessels drawing up to 17 ft., as previously explained in page 2 of the Addenda. It has numerous dangers in it, many marked by *buoys* or *beacons*, but local knowledge is necessary for its safe navigation.

Page 603.—**DUKE of CLARENCE STRAIT**.—*Lincoln Rock*, covering at high water, lies beyond Point Stanhope, on the N.E. side of the channel, in lat. $56^{\circ} 34' N.$; it is marked by a *red nun buoy*, lying in $7\frac{1}{2}$ fathoms, about 2 cables S.W. of it.

Page 603.—**Sumner Strait** separates Prince of Wales Island from Kuprianof Island, and in about mid-channel of its eastern part, westward of Zarembo Island, are two dangerous rocky patches, steep-to. *McArthur Reef*, the easternmost, has $2\frac{1}{2}$ fathoms over it, and is marked by a *nun buoy*, painted in *red and black bands*, lying in 6 fathoms, off its N.E. side, at 3 miles S.E. $\frac{1}{2}$ E. from Mitchell Point. At 3 miles S.W. $\frac{1}{2}$ W. from McArthur Reef is *Eye-opener Rock*, drying 12 ft., marked by a *mast beacon*, bearing a *barrel*. (See page 2 of the Addenda).

On *Point Barril* is a salmon saltery, &c.

Shakan or *Chican Bay*, 10 miles southward of Port Protection, is filled with islands, and at its head is a small village, with a post-office, sawmill, and store.

Page 606.—**Klawak**, or *Tlewak*, at the head of Port Bucareli, is the most important settlement on Prince of Wales Island. It has a post-office, salmon cannery, stores, sawmill, &c.

Page 606.—**Port Cordova** has a large group of islets and rocks in its entrance, between which and Long Island there appears to be a clear passage. On the northern shore, opposite Long Island, is a fish cannery.

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Howkan, or *Jackson Post Office*, is a large Indian village and mission station, with sawmills, stores, &c., on the western side of *Long Island*, up *Kaigahnee Strait*.

In 1890, a rock, on which the sea broke heavily, was reported to lie about 5 miles E. by N. $\frac{1}{4}$ N. from *Rasa Isle* or *Wolf Rock*.

Pages 606, 612, 619.—**Cape Ommaney**, in 1897, was reported by the U.S. surveyors to be charted about 5 miles East of its proper position.

Page 607.—**Point Ellis**.—Near this is an extensive salmon cannery, with large stores.

Page 608.—**PRINCE FREDERICK SOUND** appears to be peculiarly free from dangers to navigation, and abounds with fish, including salmon and trout in the larger streams. At 10 miles eastward of *Cape Fanshaw* is the entrance of *Farragut Bay*, at the head of which there is sheltered anchorage. Opposite this, on the northern side of *Kuprianof Island*, is the long narrow inlet named *Portage Bay*, with $3\frac{1}{2}$ fathoms least water in the entrance.

Thomas or Wood Bay, the large inlet eastward of *Point Vandeput*, has its entrance embarrassed with shoals, and possesses very grand and varied scenery, the mountains rising 2,000 to 3,000 ft. sheer from the water, while in its northern and eastern angles there are great glaciers.

Horn Cliffs, opposite the northern entrance of *Wrangel Strait*, are very prominent, and here is a fine waterfall, where water can be obtained by boats.

Leconte Bay, 10 miles eastward of *Horn Cliffs*, is always full of icebergs, derived from the glaciers, but abounds with seals, which are hunted by the Indians.

Page 610.—**Stephens Passage**.—In 1889, a 3-fathoms rock was reported to lie about 2 miles S.W. $\frac{1}{4}$ W. from the outer *Twin Islet*, in the southern entrance. *Midway Islets* lie 4 miles W. $\frac{1}{4}$ N. from *Point Coke*.

Page 611.—**TAKO ARM** has been proposed as a good route of approach to the Yukon goldfields, but it ends in a glacier which breaks off in icebergs, rendering the inlet almost useless for navigation. It was proposed to construct a railway hence to *Lake Teslin*, but this is now being made from the *Stikine River* (see the Addenda for page 602).

Page 611.—**JUNEAU** now contains about 3,000 inhabitants, and its wharves are lighted by the electric light. Fresh water and provisions can be obtained here. On *Douglas Island* opposite are the famous *Treadwell* goldmines, which have yielded vast wealth, though the ore is of low grade. The passage round the northern side of *Douglas Island* can only be used by canoes.

Page 612.—**Saginaw Channel**.—*Favorite Reef*, on the eastern side of the southern entrance, is marked by a buoy, in 10 fathoms, off its S.W. edge. *Faust Rock*, of $2\frac{1}{2}$ fathoms, lying off *Point Retreat*, at the northern entrance to the channel, is marked by a can buoy, painted in red and black bands, close off its eastern side.

Page 612.—CHATHAM STRAIT has not yet been surveyed. Captain J. T. Walbran, of the Canadian Government steamer *Quadra*, in 1897, suggested the following directions for vessels bound northward through it:—From a position $2\frac{1}{2}$ cables South of Cape Ommaney (see the Addenda for page 606) steer W. $\frac{1}{2}$ N., for 7 miles, and then alter course to N.W. $\frac{1}{2}$ N., which will lead clear up the strait for about 76 miles, until Point Lull is abaft the beam. This course will pass Yasha Island about $2\frac{1}{2}$ miles distant, and Point Gardner 2 miles. *Russian Reef* lies on a line drawn between Caution Point and Distant Point, $3\frac{1}{2}$ miles from the former, well out of the general track of navigation. It lies parallel with the shore, and is about $7\frac{1}{2}$ cables long.

Page 613.—To the N.E. of Russian Reef is *Cha-ik Bay*, on the North side of which is an Indian village. At 2 miles eastward of the village is a cove, with good sheltered anchorage in 12 fathoms.

Between Point Gardner and Killisnoo, heavy tide-rips occur off nearly all the projecting points and reefs, sometimes to 1 mile off shore.

Kelp Bay is the large indentation on the western side of the strait, opposite White Water Bay. Its northern arm runs $3\frac{1}{2}$ miles westward, and is connected with Hanus Bay, in Peril Strait, by a flat covered 2 or 3 ft. at highest tides. Much cedar has been cut and rafted here. Vessels can find anchorage at the heads of the various arms of the bay, in 18 to 24 fathoms.

At 4 miles southward of the southern point of Kelp Bay is a conspicuous waterfall, at $1\frac{1}{2}$ mile southward of which is *Ta-Katz Bay*, where there is good sheltered anchorage in 20 fathoms, in the basin just before it turns abruptly to the northward.

Page 613.—Killisnoo.—*Kenasnow Island* is now known as *Killisnoo*, and on its S.E. point stands a *beacon*, marking the West side of the eastern channel into Killisnoo Harbour. On the eastern side of this channel are some-sunken rocks, marked by a *red nun buoy*, in $5\frac{1}{2}$ fathoms, from which the end of the wharf bears W.N.W. There is a clear channel between the South side of the island and the low sandy *Table Islet*. The extremity of the reef extending off the N.W. end of the island is marked by a *red nun buoy*, in 8 fathoms, with the wharf bearing E. by N. A *white wooden beacon*, 20 ft. high, marks some rocks about half a mile westward of the wharf; the best winter anchorage is in 14 fathoms, with this beacon in line with the middle of Table Islet, and the wharf bearing N.E. by N. $\frac{1}{2}$ N. There is a fishing village, with a post-office, on the N.E. end of the island, and a trading station at *Koteosok*.

Kootznahoo.—A *black can buoy* lies in 5 fathoms, off the extremity of the reef extending from *Danger Point*. The coal mines are not now worked.

Pages 613, 628.—*Morris Reef* extends about 2 miles eastward from *Hayes Point*, on the western side of the strait, opposite Kootznahoo, many of the rocks showing at low water. The extremity was marked by a *buoy*. Good sheltered anchorage can be obtained in *Sitkoh Bay*, in 20 fathoms, in a bight formed on its eastern shore, 2 miles above Hayes Point.

Page 614.—Winds.—In summer, the wind blows almost constantly from the sea up Chatham Strait and Lynn Channel, which lie almost in a

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straight line, caused by the high mountains on either side diverting the air currents towards the axis of the channel. These, being heavily charged with moisture, cause frequent and heavy falls of rain or snow.

Page 614.—**LYNN CHANNEL** has become of considerable importance, now being one of the most frequented routes to the Yukon goldfields (see page 1 of the Addenda). Ocean-going vessels land their passengers at Chilcoat Inlet or at Chilcoot Inlet, at its head, but the former affords very poor shelter from the prevailing southerly winds. Mr. Ogilvie, the Canadian surveyor, reports Chilcoot Inlet to be preferable as an anchorage; Skagway Bay, near its head, is always open to navigation, and has deep water, excellent shelter, and good wharves for large vessels.

Hanus Reef is marked by a *can buoy*, painted in red and black bands.

In *Funter Bay*, opposite Point Couverden, are some goldmines.

Page 615.—**Vanderbilt Reef** is marked by a *buoy*, 1 cable off its N.E. side; attempts have been made to establish a mast *beacon* on the reef, but it has been washed away.

Favorite Channel.—*Poundstone Rock* is a dangerous 12-ft. pinnacle, lying nearly in mid-channel of the northern entrance; it is marked by a *can buoy*, painted in red and black bands, lying in 3 fathoms, off its western side, 1 mile S. $\frac{1}{2}$ E. from Sentinel Island. Should the buoy be adrift, vessels approaching from the northward, after passing Vanderbilt Reef buoy, should steer for the eastern edge of Shelter Island until up to that island, and then keep a mid-channel course down Favorite Channel. Approaching from the southward, steer a mid-channel course with Portland Island astern, until the South end of Sentinel Island is in line with the S.E. end of Benjamin Island.

Berners Bay has a sawmill in it, about $3\frac{1}{2}$ miles northward of St. Mary Point. At $8\frac{1}{2}$ miles N.W. by W. from this point is a settlement named *Seward*, with mines and sawmills. In 1897, there was a dangerous sunken wreck lying in the anchorage in *William Henry Harbour*.

Page 616.—**CHILCAT INLET.**—There is a village, with a fish cannery, at *Pyramid Harbour*, and others on the opposite shore. *Dalton's Trail* to the Yukon River, by way of the Chilcat and Klahaela Rivers, is a good and easy route for those bound to or from the goldfields, and may possibly be used during winter, but a great many pack-horses would be necessary, as the land transit of about 300 miles takes two to three weeks.

Page 617.—**CHILCOOT INLET.**—There is a mission station, with a post-office, at *Portage Bay*. The compasses are liable to considerable disturbance between this bay and Battery Point to the southward, the needle being sometimes deflected to the extent of one or even two points to the westward. This disturbance has been noticed to decrease gradually to the southward of Battery Point, the needle resuming its normal direction when about 4 miles distant from that point.

Skagway River.—At the entrance, near the head of Chilcoot Inlet, and 3 miles southward of Dyea, there are wharves reaching into deep water, where large vessels may safely lie and discharge cargo at any time of tide. Vessels anchor in depths from 30 to 40 fathoms, mud. In February, 1898,

about 6,000 people were encamped here. Hence there is a trail over the *White Pass* to Lake Bennett, 28 miles distant, whence the Yukon gold-fields can be reached by canoe or boat, the Klondyke being over 500 miles distant. This pass, attaining an elevation of 2,600 ft., is considered easier to surmount than the Chilcoot Pass, but both are obstructed by deep snow in winter.

Dyea Inlet, the head of Lynn Channel, has no harbour, but the anchorage is reported to be better than that at Skagway, though vessels coming here would be exposed to the violent winds which blow up it. Ocean-going vessels here transfer their passengers and cargo into boats or barges, if they be bound for the Yukon goldfields by way of the *Chilcoot Pass* to Lake Bennett. At 15 miles from the sea this pass attains an elevation of 3,600 feet, and, being impassable for horses, a wire tramway has been erected to haul goods to the summit.

Wharves and other accommodation for large vessels are being constructed, and in February, 1898, about 5,000 people were encamped here. Large vessels lie in about 28 fathoms, mud, southward of the flats, which dry 1 mile out at low water, and are steep-to.

Page 619.—**CAPE OMMANEY**.—See the Addenda for page 606.

Page 620.—**Siwash, Berry**, or *Tenakee Inlet*, is long and narrow, with deep water, and at its head is a narrow portage for canoes to Port Frederick. On its North side, about $8\frac{1}{2}$ miles within the entrance, is a village of Hoonah Indians, where there are some hot sulphur springs.

Page 621.—**CROSS SOUND**.—See page 2 of the Addenda. In 1898, the U.S. surveyors reported that Pleasant, Porpoise, Sisters, and Spasskaia Islands, are charted about long. 7', and Point Sophia about 10', too far West.

Page 621.—**Port Frederick**.—In 1893, the U.S.S. *Pinta*, drawing $11\frac{1}{2}$ ft., at low tide touched on a sunken rock on the West side of the entrance, at about 2 miles W. $\frac{1}{2}$ N. from Point Sophia. There is a mission station at *Hoonah Harbour*.

Page 622.—**GLACIER BAY**.—In the "American Journal of Science," January, 1887, is an article by Mr. G. F. Wright, in which he estimated that the *Muir Glacier*, the most imposing of the five immense glaciers at the upper part of the bay, and which has a sea-face of 1 mile, represents a body of ice measuring about 5,000 ft. wide by 700 ft. deep, entering the sea at an average rate of 40 ft. a day. At 10 miles inland it is 10 miles in width.

Pages 623-624.—**Port Althorp**.—In 1896, Capt. H. H. Lloyd, an Alaska pilot, reported this harbour as good for vessels of any size, and as being easy to approach. Off the western shore, near its head, is a round wooded islet, eastward of which there is anchorage in 22 fathoms, mud. The anchorage N.W. of *George Island* is not good, the bottom being very rocky; a rock, 130 ft. high, lies $2\frac{1}{2}$ cables S.W. $\frac{1}{2}$ S. from the western point of the island, with which it is connected by a reef.

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Pages 624-625.—Directions.—The group of islands lying between Wimbledon and Lavinia Points are named *Inian Islands*, and vessels must not attempt to pass southward of them, this narrow channel being dangerous, and the tidal current sweeps through it with terrific force. Vessels should pass about mid-channel between the N.W. island and Wimbledon Point, where there are no known dangers, though floating ice and thick fogs may be met with.

Page 627.—Nevski or Neva Strait.—Several of the rocks and dangers are now marked by *buoys* and *beacons*, but local knowledge is necessary for the safe navigation of this narrow and intricate channel.

Pogibshi Channel, or Peril Strait, is largely used by the local coasting and other vessels. *Brad Rock* is a dangerous rock, with $7\frac{1}{2}$ ft. over it at low water, reported by the surveyors in 1898. It lies about 150 yards East of the first point above *Salmonberry Cove*, on the West side of the southern entrance to the channel. In the narrows the tidal streams sometimes run 10 knots an hour, causing rapids, whirlpools, and eddies. Slack water lasts only about 20 minutes.

Page 628.—Fairway Islet, lying in the eastern entrance of Peril Strait, is a prominent mark, being about 320 ft. high, and covered with trees.

Hanus Bay, 4 miles south-westward of Fairway Islet, is frequented by Indians for drying fish, and is not recommended for large vessels. At 4 miles farther westward is *Sa-ook Bay*, affording good anchorage in 18 to 22 fathoms, mud, above a spit projecting from the western side, $1\frac{1}{2}$ mile from the entrance. *Rodman Bay*, the long inlet $4\frac{1}{2}$ miles farther westward, has irregular depths in its entrance, but there is good anchorage near its head, in 10 to 12 fathoms, southward of two islets.

Page 631.—SITKA SOUND.—Eastern Channel.—A *white beacon*, 20 ft. high, known as the *West Beacon*, has been erected on *Makhnati Island*, and over 2 miles to S.E. by E. $\frac{3}{4}$ E. is the *East Beacon*, also white, standing on the summit of the *Eckholms*. *Zenobia Rock* was marked by a *buoy*, but it was discontinued in 1895. A *nun buoy* lies in 10 fathoms, southward of *Makhnati Rock*, and 3 cables South of the *West beacon*. *Tzaritzka Rock* is marked by a *black can buoy*, lying in 10 fathoms, at about $1\frac{1}{4}$ mile N.E. by N. $\frac{3}{4}$ N. from the *East beacon*; and another lies in 5 fathoms, close southward of *Simpson Rock*. A $3\frac{1}{4}$ -fathoms pinnacle rock lies $4\frac{1}{2}$ cables E. by N. $\frac{3}{4}$ N. from the *East point of Katz Island*.

Middle Channel.—A *black can buoy* lies in 5 fathoms, close southward of *Keene Rocks*. *Channel Rock* is marked by a *pole beacon*, and nearly 2 cables to N. by E. $\frac{1}{4}$ E. is a *black spar buoy*, in $5\frac{1}{2}$ fathoms, marking the North side of the channel. A *red spar buoy* lies in 6 fathoms, marking the North end of the shoal, at $1\frac{1}{2}$ cable N.N.E. of *Channel Rock beacon*. A 9-ft. rock lies $1\frac{1}{2}$ mile W. $\frac{1}{4}$ S. from the same beacon, and north-eastward of *Apple Islands*; and a rock awash lies 1 mile W. by N. from the beacon.

Pages 632-634.—SITKA contained 1,190 inhabitants at the census in 1890, of whom 294 were whites. The citadel was destroyed by fire in

March, 1894. There is regular communication by steamer with San Francisco, Victoria, Puget Sound, Ounalaska, St. Michael's, &c. A *fixed bright lantern light*, elevated 108 ft., is shown on a white framework on *Castle Rock*, in the N.W. part of the harbour.

Page 635.—**The COAST** between Cape Spencer and Prince William Sound affords only two safe anchorages, with landing all the year round, at Yakutat village and Kayak Island; though in summer, the Indians can land at Lituya Bay, Dry Bay, at the head of Yakutat Bay, at Icy Bay, Icy Cape, and Cape Yataga. Lieut. H. W. Seton-Karr, who examined this region in 1886, states that eastward of Yakutat and Icy Bays there exist small plains covered with forest of spruce and cedar, but elsewhere the plains consist of bare stones covering huge glaciers. The coast-line is therefore undergoing constant alterations.

Pages 636-637.—**Yakutat Bay**.—In 1895, breakers were reported as extending $2\frac{1}{2}$ cables off *Cape Phipps* and *Ocean Cape*. H.M.S. *Hyacinth* found good anchorage in 13 fathoms, off the Indian village, with Cape Phipps bearing S. 55° W., and Turner Point S. 85° W. Deposits of coal exist in this region. There is a Swedish mission station at *Port Mulgrave*.

Disenchantment Bay, the inlet at the northern angle of Yakutat Bay, is surrounded by magnificent scenery, and the largest vessels could safely use it. At the end of the 18th. century it was closed by a wall of ice, which has retreated 5 or 6 miles since that time.

Page 638.—**Point Manby** is a low wooded bluff, and between this and Icy Cape the water is often discoloured, probably by streams from the glaciers.

Page 638.—**ICY BAY** is now merely a slender bight, the bay having been filled up by débris brought down by the *Yahtse River*. *Icy Cape*, the extremity of the Guyot Glacier, consists of ice cliffs about 300 ft. high; it is reported to be in lat. $60^{\circ} 10' N.$, long. $141^{\circ} 27' W.$, or about 12 miles northward of the position shown on the chart.

Page 639.—**MOUNT ST. ELIAS** was decided by the Boundary Commission, in 1892, to be in Canadian territory, its summit being elevated 18,017 ft., in lat. $59^{\circ} 17' 34\frac{1}{2}'' N.$, long. $140^{\circ} 55' 19\frac{1}{2}'' W.$ Its summit was attained for the first time on July 31, 1897, by the Italian Prince Luigi Amadeo di Savoia, who made the elevation, by mercurial barometer, to be 18,060 feet. No traces were seen of any volcanic action, as reported previously. It has been seen from sea when 150 miles distant. About 17 miles to the north-eastward of Mount St. Elias is *Mount Logan*, rising to an elevation of 19,512 ft., the highest peak on the North American continent, and about 2 miles from this is another peak, elevated 19,276 feet.

Pamplouz Rock was carefully searched for, but in vain, by the U.S. survey steamer *Hassler*, in 1892, no trace of any danger being encountered. Sealing and other vessels also report having seen no indication of such a danger near the charted position.

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Page 640.—**Cape Suckling** is now considered to be in about longitude 144° W. About 4 miles to the southward and westward of it are two shoals usually marked by breakers.

Page 641.—**Kayak Island**.—Some Swedes were found living on this island, in 1886, engaged in hunting sea-otters. *Cape St. Elias* or *Hamond* has a reef extending many miles southward of it, on which, at about 6 miles from the cape, stands a flat perpendicular rock, 500 or 600 ft. high. Great caution must be exercised when navigating in this vicinity. A rocky ledge is reported to lie $3\frac{1}{2}$ miles S.W. $\frac{1}{2}$ S. from the cape, on which the barque *Sea Ranger* was lost in 1893. There is not less than 6 fathoms in the channel northward of Kayak Island.

Page 642.—**Wingham, Mitchell**, or *Little Kayak Island*, had a settlement on the S.E. point, which is connected with Kayak Island by a bank having 19 ft. over it, inside which there is good anchorage. The tide rises 9 feet.

On the western branch of the wide delta of the *Atna* or *Copper River* is a small settlement named *Alaganik*.

Middleton Island is about 5 miles long, and $1\frac{1}{2}$ mile wide near the South end, its central and highest part being elevated 140 feet. Hence it declines towards the North to a long sandspit, dry at low water. It is surrounded by kelp and foul ground, and is covered with grass and bushes, the resort of wild geese, ducks, and sea-birds. Breakers are said to extend more than 10 miles off its southern end. There is good anchorage about the centre of the West side, and thence to the South end extends an unbroken line of dark boulder clay cliffs about 100 ft. high. On the East side the cliffs are from 30 to 50 ft. high. In 1892, there were a few settlers on it.

Fountain Rock is variously reported to lie $2\frac{1}{2}$ to 5 miles northward of the North point, and a rock, on which the barque *Northern Light* struck, in 1882, lies nearly 4 miles S. 32° E. from the S.E. point of the island. Capt. Simmons, of that barque, stated that *Sea Otter Reef* lies about 19 miles N. by W. $\frac{1}{2}$ W. from the North point of the island; it is about 2 miles long, East and West, awash at low water, and breaks heavily. Overfalls have also been seen 6 or 8 miles eastward of this reef. In 1893, a sunken reef was reported to lie nearly midway between the island and Cape Hinchinbrook, in lat. $59^{\circ} 50' N.$, long. $146^{\circ} 30' W.$, about half a mile long, East and West, and sometimes breaking.

The tidal streams hereabout run 2 to 3 knots an hour, the flood setting to the N.E., and the ebb to the S.W.

In 1895, the U.S. authorities reported that Cape Suckling, Cape St. Elias, Cape Hinchinbrook, and Montague Island, lie about $21'$ of longitude eastward of their charted positions.

Pages 642-643.—**PRINCE WILLIAM SOUND**.—Steamers entering or leaving can use the channel westward of Montague and Green Islands, all the dangers being reported as visible, but sailing vessels are recommended only to use the channel between Hinchinbrook and Montague Islands.

Hinchinbrook Island is mountainous, and was covered with snow at the

beginning of June. *Cape Hinchinbrook*, a gently sloping ridge, is now considered to be in about long. $146^{\circ} 26' W$. *Seal Rocks* are two bare blackish rocks, about 40 ft. high, surrounded by numerous small rocks extending about $1\frac{1}{2}$ cable off. A reef extends about 1 mile to N.E. by N., and heavy breakers have been seen extending $1\frac{1}{2}$ mile to the eastward and southward. Consequently, they should be given a wide berth.

Port Etches is safe of approach, and vessels may take up anchorage as convenient, the usual berth being with Phipps Point bearing W. $\frac{1}{2}$ N. In severe gales, a line of breakers extends from Porpoise Rocks to Fort Point. On the latter is the trading settlement, known as *Nuchuk*, which contained 62 inhabitants in June, 1894, and the Russian fort no longer exists. No supplies could be obtained here, but wood and water were plentiful. Boats approach it from the northward, by way of Constantine Harbour, the least depth in the entrance channel being about 9 ft. at low water. A spit of shingle, elevated about 35 ft., connects the village with the shore to the westward, and forms the southern boundary of the harbour.

Page 644.—**Hawkins Island** is divided by a boat passage leading into Port Cordova from the central part of its South shore, and has three small islands off its N.E. end.

Port Cordova.—Vessels bound here, from off Port Etches, usually steer N.W. by N. $\frac{1}{2}$ N. for *Knowles Head*, the black bluff between Port Gravina and Port Fidalgo. When about 6 miles from it, they alter course to N.E. by E. $\frac{1}{2}$ E. for the northern side of the bay, avoiding the Hawkins Island shore, until well within the bay.

At *Orea*, about 6 miles to the N.N.E. of Cape Witshed, are two salmon canneries. Vessels bound here usually pass through the 19-ft. channel between Hawkins Island and the island off its eastern end, and then feel their way with the lead.

Page 645.—Many islets and rocks lie off the point between Port Cordova and Port Gravina; in the latter there is good anchorage, between the southern point and a low wooded island 2 miles to the N.W. of it.

Port Fidalgo is reported to be full of shoals. A shoal flat is reported to occupy the western part of the sound between this and the North point of Nowell Peninsula.

Pages 645-646.—*Passage Canal*.—There is a portage from the head of this inlet to the head of Turnagain Arm, in Cook Inlet.

Pages 647-648.—**MONTAGUE ISLAND** is very high and mountainous. Rocks and foul ground extend 2 miles off the N.W. point, and an islet lies off the N.E. point. The western bay at the N.E. end affords good anchorage. *Wooded Islands*, about 17 miles north-eastward of Cape Cleare, extend about 7 miles along the coast, and attain an elevation of 130 feet. They should be given a berth of at least 2 miles. Off *Cape Cleare* are several large rocks, and a reef extends about $1\frac{1}{2}$ mile southward of it.

The coasting steamers use the channel between Montague and Green Islands, although it is reported to be full of rocks. There is said to be good anchorage in the northern part of *M'Leod Harbour*.

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Page 649.—Chiswell Isles.—The southern *Seal Rock* is now considered to lie in about lat. $59^{\circ} 33' N.$, long. $149^{\circ} 34' W.$

In 1890, there was a small settlement named *Lowell* in *Resurrection Bay*, the only one between *Cape Puget* and *Cape Elizabeth*.

Page 649.—Cape Elizabeth is in about long. $151^{\circ} 52' W.$ *Chugatz Islands* are high, and generally topped with snow, the lower parts being wooded. They appear to be safe of approach to 1 mile distant.

Page 650.—COOK INLET has attracted considerable attention of late years, owing to its fisheries and lignite coal deposits, seams 2 to 7 ft. thick appearing on the surface, and gold has been found in *Turnagain Arm*. The following information is gained from the reports of the U.S. surveyors, and of captains of vessels who have visited its shores.

Northward of *Anchor Point*, the eastern shore is low, with many lakes and rivers, and with an unbroken line of uniform flat bluffs, 110 to 160 ft. high, as far as *Cape Kussilof*, where there is a break, and then the bluffs become lower as far as *Kaknu River*, when they again become higher. Near *Cape Douglas* the coast is also low and flat, but to the northward the western shore is mountainous, the lower slopes being wooded, but between the West and North Forelands it becomes again low and flat.

In the upper part of the inlet, the water is of a whitish colour, with yellowish patches during flood tide.

In summer, clear warm weather prevails, a great contrast with the rainy weather then experienced in *Prince William Sound*.

Tides.—The tidal streams run from $1\frac{1}{2}$ to $2\frac{1}{2}$ knots an hour, the main stream of flood setting parallel with the eastern shore until deflected by the East Foreland towards the opposite coast. The ebb runs stronger near the West shore, and there is said to be a constant southerly set off *Cape Douglas*. At *Kussilof River* the tide rises from 18 to 28 feet.

Directions.—By keeping 5 miles off the eastern shore, as far as the East Foreland, a vessel will clear all dangers. Northward of *Kalgin Island*, the lead should be kept constantly going, as shoals are continually forming or altering. If bound to the upper part of the inlet, cross from under the East Foreland to the West Foreland; either may be approached to a distance of about $1\frac{1}{4}$ mile. Round the West Foreland and haul for the North Foreland, keeping on that side of the channel from which the tide sets. From North Foreland a course N.E. $\frac{1}{4}$ E. carries to the islands off *Point Mackenzie*.

Barren Islands are seldom topped with snow. Heavy tide-rips are formed westward of *Amatuli*, the western island, and a shoal is reported to lie 5 or 6 miles E. $\frac{3}{4}$ S. from it.

Cape Bede.—Flat or *Magnet Island* lies northward of *Cape Bede*, and tide-rips have been seen $1\frac{1}{4}$ mile off it, near a depth of 30 fathoms.

Graham or *English Harbour* has a trading settlement on its southern shore. On the North side of the entrance are some abandoned coal-mines.

Page 651.—Chetolnu Bay, 7 miles N.E. of *Dangerous Cape*, is a narrow inlet, which can be entered by vessels drawing 12 ft., and has a shingle

beach in its inner part, where they could be cleaned or repaired. On its eastern side is the fishing village of *Saldovia*.

CHUGACHNIK or KACHEKMAK BAY.—*Archimandritof Rocks*, lying to the south-westward of *Coal* or *Entrance Point*, are reported not to exist as shown on the chart. This point is said to be extending to the southward, and has some buildings near its extremity; vessels should not anchor in less than 8 fathoms. In 1895, the steamer *Chehalis* obtained 30 tons of coal from the bluff between *Coal Point* and *Bluff Point*. The latter is high and perpendicular, and between this and *Anchor Point*, a low sandy projection 12 miles to the W.N.W., kelp extends 4 miles off shore. To the S.E. of *Anchor Point* is a village, from which a rocky shoal extends about $3\frac{1}{2}$ miles to S.S.E.

Page 652.—Between *Anchor Point* and *Cape Kussilof*, rocks extend 1 to 2 miles off shore, uncovering at low water. *Munina*, or *Ninitchik*, is a village 22 miles northward of *Anchor Point*; two reefs extend 2 miles off it, and there is good anchorage between them.

Kussilof River, 18 miles beyond *Munina*, has a village with some fish canneries at its entrance, off which *Karluk Shoal* extends for several miles, partly drying at low water, and curving towards the shore on either side. In 1896, a barrel buoy was placed on its outer edge. *Cape Kussilof*, to the S.W. of the river entrance, is not a prominent mark, but at 8 miles southward of it are three conspicuous rocks, 20 ft. high, called the *Sisters*. In September, 1897, the U.S. surveyors on the *Albatross* recommended vessels coming here to stand in for the cannery buildings bearing E. by N., and to anchor 3 to 4 miles from them, allowing for 30 ft. or more as the range of tide. Hence a staked boat channel, dry in places at low water, leads in to the mouth of the river. The *Albatross* found $2\frac{1}{2}$ fathoms at 6 miles W.N.W. of the canneries. In 1895, Capt. Salvesen, of the steamer *Jennie*, reported having sounded on a 3-ft. pinnacle rock, nearly 6 miles W. by N. $\frac{1}{2}$ N. from the canneries.

Kaknu River has a village known as *Kenai*, with a salmon cannery and trading station, on the North side of its entrance, which is fronted by reefs.

Kamishak or *Bourdieu Bay*, the large bight westward of *Shaw* and *Augustine Islands*, is shallow, and should only be used by small vessels. Sunken rocks appear to lie between these islands, so that vessels entering should either pass southward of *Shaw Island*, or northward of *Augustine Island*. There is a village at *Portage*, in its N.E. angle.

ST. AUGUSTINE or *Ouchouganat Island* is a conical active volcano, about 3,000 ft. high, which had a violent eruption in 1889. A rocky patch, partly awash at half-tide, lies 7 miles S.E. of the peak, and others are said to lie farther out.

Chinitua Bar, 11 miles S.E. $\frac{1}{2}$ S. from *Iliamna Volcano*, is protected by a reef and islets extending from its southern point. There is a small village here. Hence to *Kalgin Island* the coast is fronted by extensive banks and shoals, some drying at low water, within which is a deep channel. *Iliamna* or *Iliaminsk Volcano* is active, and rises to a sharp peak. Brown bear and deer abound in these regions.

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Tuxedni or *Snug Harbour* is a good anchorage, the entrance being southward of *Chisick Island*, the approach northward of that island being closed by a reef.

In 1895, Capt. Salvesen reported that the 4-fathoms shoal, charted 5 miles south-eastward of *Chisick Island*, does not exist, having frequently steamed over this area, and found depths of 17 to 19 fathoms. He also could not find the 5-fathoms shoal shown 6 miles farther southward.

If bound to *Chinitua* or *Snug Harbour*, keep South of the parallel of *Anchor Point*, hauling up to the western shore when *Iliamna Volcano* bears N.W. by N., keeping to the westward of the banks, and using the lead constantly.

Page 653.—**Kalgin** or *Coulgiac Island* is very low and wooded, with some islets off its northern end. Shoals extend 7 miles northward of it, about 3 miles off its eastern shore, and far to the S.W. of it.

Redoubt or *Burnt Mountain*, 11 miles westward of *Point Harriet*, rises to an elevation of 11,270 ft., and is an active volcano, its summit being somewhat flat. A large glacier descends into *Redoubt Bay*, between *Point Harriet* and the *West Foreland*.

In May, 1896, Capt. Lundquist, of the steamer *Albion*, anchored in 10 fathoms, sand, poor holding ground, northward of the *West Foreland*, and found the tidal stream running 8 or 9 knots an hour.

Between the *East* and *North Forelands*, the greater part of the area is occupied by an extensive shoal, which is extending westward. The channel here passes near the western and northern shore, which forms *Trading Bay*, on the North side of which is the village of *Tyonick*. A few miles northward of the *North Foreland* is a salmon-salting factory.

Page 654.—*Sushitna River* runs into the northern angle of *Cook Inlet*, through a delta bordered by extensive mud-flats, drying nearly 10 miles off at low water, and here the tide rises over 30 feet. The mud is so sticky that a boat grounding on it may be swamped by the incoming tide. It is considered to be one of the largest rivers of Alaska, and traces of gold have been found on its banks.

The inlet to the N.E. of *Turnagain Island* is now known as *Knik River*.

Turnagain Arm is embarrassed with shoals, and the tides run 5 to 6 knots at springs, the rise ranging from 13 to 35 ft., so that great caution is required in its navigation. There is a portage from its head to *Passage Canal*, *Prince William Sound*. A dangerous rock, drying at half-tide, lies in mid-channel, $1\frac{1}{2}$ mile E. by N. $\frac{1}{2}$ N. from *Point Possession*. Captain Lundquist found good anchorage in 6 fathoms, close to the beach, just eastward of this point, out of the run of the tide. Drift-ice was seen here, in May, 1896.

Page 655.—**KADIAK ARCHIPELAGO**.—The climate is mild enough to allow the rearing of cattle and sheep, and the raising of potatoes. The shipment of ice has been discontinued.

Page 656.—**Portlock and Albatross Banks** are the wide bank of soundings fronting the eastern shores of the *Kadiak Archipelago*, and they

abound with fish, chiefly cod, halibut, and red rock-fish. The bottom consists of sand, gravel, and broken shells.

Shuyak Island, the northernmost of the Kadiak Archipelago, is low and wooded; it appears to have rocks extending 5 miles off its northern side, and is separated from Afognak by a narrow strait, only navigable at slack tide.

Afognak Island has numerous outlying rocks around it, and off its northern end lies *Sea Otter Islet*, surrounded by breakers to at least 2 miles distant. In the bay westward of *Tonki Cape*, the N.E. extreme, sealers find good anchorage, and obtain supplies of wood and water. The only permanent settlement is at its southern end, where there is a trading store, &c. *Marmot Island*, lying eastward of Afognak, is high and flat, with rocks extending off its North end to abreast Tonki Cape. The strait between the S.W. coast of Afognak and *Raspberry Island* is not navigable.

Ougak or *Ugak Island* has three small peaks, and is reported to lie about $1\frac{1}{2}$ mile south-eastward of its charted position.

ST. PAUL HARBOUR, being easy of access, is a great rendezvous for sealers, and there is regular communication by steamer with Sitka and Unalaska. Small quantities of coal may sometimes be obtained here, but provisions were not to be had. Large vessels can go up to the wharf. Fish abounds in the harbour, but is said to be unwholesome. Small vessels can haul up on the beach in the inner harbour. At the census in 1890, the population numbered 495.

Page 657.—*Long Island* has steep rocky cliffs, and its summit is covered with trees. It is used for pasturing cattle, and breeding the black fox.

In 1895, Capt. Hansen, of the schooner *Kadiak*, reported that *Hutchinson Reef* is actually part of the reefs about *St. George Rock*, and is charted about half a mile S.E. of its proper position.

Humpback or *Sugarloaf Rock* consists of two or three small rocks, with one large one, said to be only 6 ft. high; they appear as one from the S.W. or N.E. At three-quarters of a mile S.S.W. of it is a rock, awash at low water, and $1\frac{1}{2}$ mile farther on is *Kalisin Reef*, awash at high water.

Directions.—The southern approach to St. Paul Harbour is the better. The North channel is good in clear weather, but Williams and Hutchinson Reefs make it dangerous in thick weather. Vessels should not attempt to pass between Williams Reef and Long Island. In 1893, the following directions were issued by the U.S. authorities:—

If entering by the North channel, in ordinary weather, Williams Reef appears to be the best mark for making it. Passing at 1 mile to the northward and westward of it, steer for the Channel Rocks, changing course when the strait between Near and Kadiak Islands is open, which leads to the wharf.

If coming from the southward, it is best to make for Ugak Island, though in any but thick weather Cape Greville, with its outlying rocks, is unmistakable, and gives the best bearings for making the outer Humpback; in fair weather, a peculiarly shaped ridge on the mainland, called the Devil's Thumb, if brought over the southern end of Long Island, will lead to it.

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When abeam, distant about 1 mile, a course West, passing half a mile southward of the inner Humpback, clears the Chalk Patch. When the strait between Wooded Island and Long Island is closed, change course to N. $\frac{1}{2}$ W., steering for the white church near the western point of Wooded Island. When almost up with this point, which is marked by kelp, steer N. by W. $\frac{1}{2}$ W. for a few huts on the beach of Kadiak Island, and anchor in about 14 fathoms.

Off the western side of Wooded Island, to the S.W. of the Russian church, is a dangerous network of lost anchors and chains. Strong tide-rips and eddies also render this anchorage an undesirable one.

Page 659.—**Cape Greville** or *Chiniak* is low and broken, backed by pine-clad hills and sharp snowy mountain peaks, and dark rocks extend about 2 miles northward of it. *Ugak* or *Igatskoy Bay*, or *Eagle Harbour*, has the native settlement of *St. Orlovsk* on the South side of the entrance, and canoes can pass hence to the northern arm of Kiliuda or Kiluden Bay.

Sitkalidak Island is separated from Kadiak by a narrow strait, the eastern part of which is not safe for vessels drawing over 8 ft., without local knowledge. A breaking rock lies over 1 mile northward of *Cape Barnabas*. There is a settlement in *Port Hobron*, the second bay inside Cape Barnabas, and here is a good harbour for vessels of any class, with fresh water in abundance from a mountain stream.

Old Harbour, on the Kadiak shore, in lat. $57^{\circ} 11' N.$, long. $153^{\circ} 13' W.$, affords anchorage in 7 fathoms off the salmon-fishing village named *Nunamiut* or *Three Saints*, which can be safely approached by keeping in mid-channel. About 4 miles farther southward, with *Lisianski Bay* lying between, is *Three Saints Bay*, with the village of *Ziatitz* on the South side of the entrance, and subject to furious squalls.

Alsentia Bay, westward of Two-headed Island, has a village at its head, with good anchorage off it, but N.E. winds send in a heavy sea. *Geese Islands* lie off the southern end of Kadiak, the channel between being unsafe, but between the western island and Cape Trinity is *Russian Harbour*. A rock lies about 2 miles north-eastward of the eastern island. *Sitchinak Strait* separates these from Trinity Islands, and tide-rips are met with in it; in mid-channel, depths of 12 to 17 fathoms will be found, giving the Geese Islands a good berth.

In 1894, the U.S.S. *Ranger* sounded in 15 to 21 fathoms, sand and rock, on a bank lying from 21 to 30 miles eastward of Sitchinak Island.

The U.S. authorities report that the coast and islands hereabout are 5' westward of the positions shown on the British charts.

Sitchinak Island consists of two parts, the western low, and the eastern much higher. It is surrounded by foul ground, except on the North side, and some small rocks lie about 1 mile E.N.E. from its East end. Coal has been found here.

Tugidak Island is low and marshy, and heavy breakers are reported to extend 12 to 15 miles off its eastern side, and shoal water 10 miles south-

ward and westward of it. A dangerous rock is said to lie at least 7 miles West of its South end.

Alitak Bay has a large salmon cannery a few miles northward of *Akhiok*, the village at its entrance. *Cape Alitak*, on the West side of the entrance, is a peninsula, with a high double peak, with anchorage in 9 fathoms, sand, at 3 miles to S.E. by E. $\frac{1}{4}$ E. Northward of it is the inlet known as *Lazy Bay*, which can be safely entered by steering N.W. $\frac{1}{4}$ N. for a conspicuous dark peak, 1,010 ft. high, on its northern side, and anchor as convenient, in 15 fathoms and under. Good water is plentiful. *Olga Bay* is the head of a long inlet on the N.W. shore of Alitak Bay, and has a salmon cannery at its N.E. end.

Cape Karluk rises abruptly to an elevation of 1,600 ft., and there is a busy settlement on the spit at the mouth of the river, with large salmon canneries. In 1890, over 3,000,000 salmon were dealt with here.

Ooujak or *Uyak Bay* is frequented by vessels for shelter from northern and eastern gales. On an islet at its entrance are a wharf and shed, and on the western shore, about 10 miles from the entrance, is an inlet named *Larsen Harbour*, where there is a salmon cannery.

Page 660.—**Chelighoff Strait**.—From Cape Douglas south-westward, the coast of the mainland has the appearance of a rugged chain of mountains, rising abruptly from the sea, indented by numerous bays and inlets, and fronted by many rocks and a few islets.

About 20 miles S. $\frac{1}{4}$ W. from Cape Douglas is the off-lying island of *Kiupalik*, on an inlet westward of which is the village of *Kaguyak*, or *Douglas*. At 16 miles beyond this is the projection named *Cape Nukhshak*, on the South side of *Hallo Bay*, from the head of which there is a portage to *Lake Naknek*. At 4 miles south-westward of the cape is the native fishing village of *Kukak*; much salmon is caught in the inlet or bay to the S.W. of it.

At 25 miles S. by W. from Cape Nukhshak is *Takhli Island*, in front of *Amalik Harbour*, where there is sheltered anchorage in 10 fathoms, sand. Seams of brown coal have been found here.

Katmai, 14 miles westward of Takhli Island, is the largest permanent settlement on this part of the coast, and is situated up a small salmon river, whence there are trails to *Lake Naknek* and *Becharoff*. Traces of coal and petroleum have been found hereabout. Hence to *Wrangell Bay*, about 80 miles to the S.W., there are no permanent settlements, but the bays are frequented by fur-hunters.

The head of *Poualo* or *Cold Bay* is in about latitude $57^{\circ} 47\frac{1}{2}'$ N., long. $155^{\circ} 28'$ W., and about 12 miles from *Lake Becharoff* or *Nanouantoughat*.

Page 665.—At 12 miles beyond Cold Bay is *Portage Bay*, much nearer the lake. Westward of this bay are *Becharoff* and *Kialagvit Bays*, fronted by islets and rocks. There is a trail to Lake Becharoff from the former bay.

Wrangell Bay lies 32 miles south-westward of Cold Bay, and here is a fishing and trading village, where the schooners put in for fresh bear or deer meat.

Chignik Bay is the large open bight, about 70 miles south-westward of Wrangell Bay, and **Tuliumnit** or *Castle Point*, on its South side, is a conspicuous landmark. There is secure anchorage in *Doris Cove* near the head of the bay. Westward of Doris Cove is a high bluff, at the entrance to *Chignik Lagoon*, which has a depth of 22 ft. at high water, deepening within to 3 and 5 fathoms. Here are some salmon canneries, the coal for which is procured from a mine a few miles up the river.

Between Tuliumnit Point and Kuprianof Point, 70 miles to the south-westward, the coast is much indented, with several off-lying islands, and affords anchorage in some parts. On *Mitrofanía Island* is a native village. In August, 1892, the *Weniaminof Volcano*, to the N.E. of Ivanof Bay, was in eruption.

Page 665.—**Semidi** or *Evdokeef Islands* were reported, in 1895, to lie only 5 miles off shore, and, with the adjacent coast, appeared to be incorrectly charted. They are used for breeding the blue and black foxes. *Lighthouse Rocks* appear to cover a space of about $2\frac{1}{2}$ cables, the largest reaching an elevation of 90 ft.; they are frequented by sea-lions.

Pages 665-666.—**Onkamok** or *Chirikoff Island* has rocks extending several miles off its West side. Vessels can anchor northward of these rocks, also off the N.E. end, and southward of the West point.

Page 666.—**SCHUMAGIN ISLANDS**, like the rest of this region, have not been carefully surveyed, and other dangers probably exist besides those shown on the chart. They are fronted by a wide bank of soundings, abounding with fish. In 1893, Capt. Gaffney reported having often fished on a small rocky 27-fathoms bank, lying 15 miles E.N.E. from the summit of Simeonoff Island, and a 23-fathoms patch is reported to lie $1\frac{1}{2}$ mile farther eastward. In 1892, Capt. Applegate reported a 7-fathoms shoal to lie with that island bearing between W.N.W. and N.W., distant 20 to 35 miles.

Page 667.—**Ounga**, or *Unga*.—There is a fishing station, with a trading store, in *Delarof Harbour*, and a gold-mining village on the northern shore of this bay, which is unsafe in S.E. gales, but small vessels can find shelter in the lagoon.

Popoff Strait, between Unga and Popoff Islands, is safe of approach from the southward, while Unga Reef, Popoff Reef, and the 15-ft. patch lying between Unga Reef and Range Island, make the northern entrance somewhat difficult. The northern entrance is marked by a *red buoy* on the East side of Unga Reef, and a *black buoy* lies on the rocky patch about $2\frac{1}{2}$ cables eastward.

HUMBOLDT HARBOUR is formed by the northern part of Popoff Strait] and on *Sand Point* is a fishing village, with a custom-house and post-office. There is regular communication by steamer with Sitka and Unalaska, and coal may sometimes be obtained here.

Light.—A local firm has placed a *fixed* light on the North side of the harbour, showing *bright* over Sand Point, and *red* over the fairway between Sand Point and Unga Reef.

Directions.—In 1893, the U.S. authorities issued the following remarks concerning the approach to Humboldt Harbour. In coming from the eastward, the U.S.S. *Mohican* passed *Castle Island*, which is high and rugged, at a distance of 2 miles, and then laid the course for *Wedge Cape*, a low sharp point. Rounding this at 1 mile distant, alter course to S.W. $\frac{3}{4}$ S. to pass half a mile eastward of the *Haystacks Islets*, and when the easternmost islet bears N.N.W., steer S.W. by W. $\frac{1}{4}$ W. to pass 1 mile South of *Popoff Head*, a high rounded projection. A W. $\frac{1}{4}$ S. course hence will lead southward of Egg Islands, and on the northern shore will be seen a reddish-yellow cliff, the eastern point of *Red Cove*, where there is a fishing village.

Pass about $7\frac{1}{2}$ cables westward of Egg Islands, and then steer for a small building on Sand Point. Give this point a berth of 2 cables, and then steer for the white buildings at the North end of the harbour, which will clear *Caton Shoal* (of $14\frac{1}{2}$ ft.), and the rocky patch eastward of it. Anchor as convenient, eastward of this rocky patch, not less than 2 cables from the wharf.

Scotland Rock, lying in the channel between *Karpa* and *Korovin Islands*, is usually marked by breakers. *Korovin Strait*, between Korovin and Popoff Islands, is deep and clear, and so also is *Gormans Strait*, between Korovin and Andronica Islands.

Nagai Island.—*Sanborn Harbour*, the inlet on the N.W. coast, affords sheltered anchorage, but vessels should not anchor in less than 10 fathoms, whence the depth shoals very rapidly. Very strong squalls occur here. On the N.E. side of the entrance is *Porpoise Harbour*, where there is a fishing station.

Mist Harbour, at the eastern end of Nagai, is entered by a channel, about 100 yards in width, with 15 to 27 fathoms in it, with a low spit on either side. Within it opens to an area about 1 mile in length, opening from $1\frac{1}{2}$ to $3\frac{1}{2}$ cables in width, with depths of 30 fathoms or more in its central part.

Spectacle Island, between Nagai and Big Koniushi, is reported to have its South end shown 2 miles too far southward on the chart; *Peninsula Islet* is placed too far to the N.E.

Sandy Cove, in *Little Koniushi Island*, is 1 mile in width, and affords good anchorage, except with S.E. winds, in 9 fathoms, sand, in the S.W. angle.

Portage Bay is the deep inlet in the coast northward of Unga Island, its head being separated from Herenden Bay, on the North coast of Alaska Peninsula, by an isthmus about 2 miles in width, and it has been proposed to construct a railway over this to the coal mines (see the Addenda for page 686). In its upper part is *Albatross Anchorage*, with depths of 9 fathoms and under, sandy bottom.

Beaver Bay, about 6 miles westward of Gull Island (off the North end of Unga), is a commodious harbour, with good anchorage in 8 to 15 fathoms, well protected from northerly winds between East and West.

The COAST, to the S.W. of Portage Bay, is deeply indented by *Pavloff*, *Cold*, and *Marshovo Bays*, besides which there are numerous other smaller

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bays, as shown on the chart, in most of which there is anchorage. Fronting this coast is a wide bank of soundings, on which lies an archipelago of high islands and numerous islets and rocks, not yet closely surveyed, within which local vessels pass. The usual route is to pass northward of Gull, Jude, Wosnessenski, Ukolnoi, Dolgoi, and Goloi Islands, then through the narrow 8-fathoms channel between the Iliasik Islands, and northward of Deer and Umga Islands, to about $1\frac{1}{2}$ mile off Cape Pankoff. The passage northward of Iliasik Islands can only be used by boats.

Pavloff Bay is exposed to gales, and is avoided even by the otter-hunters. Within its western coast is *Mount Pavloff*, an active volcano, which was in violent eruption in August, 1886.

On the West side of *Thin Point*, the West point of the entrance of *Cold Bay*, is a wide cove, where large salmon canneries have been established.

Belkoffski is a native village, containing about 185 inhabitants in 1890, mainly engaged in hunting sea-otters. The bay is open between S.E. and S.W., and the best anchorage for a stranger is in about 10 fathoms, with the church bearing W.N.W. *Bailey Harbour* affords secure anchorage in 5 to 8 fathoms, within a wide spit of shingle extending from the western shore.

Page 668.—*Sannak Island* has several peaks in its northern part, but the rest of it is low. Its highest peak, elevated 1,850 ft., has been seen when 65 miles distant. A considerable cod-fishery is carried on here, and there are several settlements. *Acherk Harbour*, at its N.W. extreme, is safe with all but N.W. winds, and there is a village here, with a wharf.

Foul ground is reported to extend far to the S.W. of the reefs southward of *Sannak*, and two isolated sunken rocks, named *Anderson* and *Lenard*, are reported to lie at 26 miles S. by E. $\frac{1}{2}$ E., and 30 miles S. by W. $\frac{1}{2}$ W., respectively, from *Mount Sannak*. These were unsuccessfully searched for by the U.S.S. *Albatross*, and others have reported them as not existing in their assigned positions. A dangerous rock, awash at low water, lies with *Mount Sannak* bearing North, in about lat. $54^{\circ} 3' N.$, long. $162^{\circ} 48' W.$

Aleks Rock, a small breaking patch, is reported to lie about 21 miles South of *Cape Pankoff*.

Issanak Strait is only navigable at its northern end by the small local schooners. There is a trading store at *Morjovi*, and a few miles northward of the village are some hot springs.

Page 669.—**THE ALEUTIAN ISLANDS** rise from the sea in steep grassy slopes, bare of trees, the higher peaks being covered with snow all the year round. The climate is far from pleasant, being windy, chilly, and damp, the average annual rainfall being estimated at about 120 inches. Fog is very prevalent. Easterly and S.E. winds bring the worst weather. No cereals will mature on these islands, but the potato is grown in small quantities, also radishes, lettuce, cabbage, and turnips. In June and July, the hill-sides are carpeted with wild flowers.

Page 670.—**OONIMAK** is said to be uninhabited, the Aleuts standing in superstitious awe of its active volcano. Rocks extend about $2\frac{1}{2}$ cables east-

ward of *Cape Pankoff*, the eastern extreme. A ledge, with three rocks on it, extends 1 mile S.E. from *Cape Lazareff*. *Cape Khituk* or *Seal Cape*, the S.E. extreme, is a rocky cliff, 150 ft. high, and there is no islet off it, as shown on the chart. At 1 mile eastward of it is a conspicuous steep hill, about 500 ft. high. *Shaw Bay*, on the North coast, eastward of *Cape Lapin*, is shallow, but affords anchorage in 6 to 9 fathoms, sand, in the S.W. angle, sheltered from all winds but those between N.W. and N.E. Bears, reindeer, foxes, wolves, and wild-fowl are found here.

Page 671.—**FOX ISLANDS PASSES** are the three navigable channels, to or from Behring Sea, between Ounimak and Ounalaska. *Ounimak Strait*, the widest, is used by nearly all vessels bound to or from Behring Sea; being clear of hidden danger, it is the safest in thick weather. *Akoutan Strait*, between Akoutan and Ounalga, is narrow, but clear of danger in mid-channel. *Ounalga Strait*, between Ounalga and Ounalaska, is safe, but tide-rips are generally found in it, the streams running strongly. In clear weather, Tigalda forms a good landmark, as also does the volcano on Akoutan.

Krenitzin Islands.—*Tigalda* and *Ougamok Islands* are both fringed with reefs on their southern sides, making it unsafe to approach them in thick weather near enough to make out the land. The strait between them is blocked up with islets and reefs.

Akoun Cove, at the N.E. extreme of Akoun, is large, and easy of approach, but is subject to heavy squalls. *Akoun Strait*, between Akoun and Akoutan, is only available for small vessels.

Pages 672, 677.—**Akoutan.**—The summit of the volcano is usually obscured by clouds or smoke. There is a village in the deep harbour on its N.E. coast. *Akoutan Strait* has islets and rocks on either side, and in bad weather the sea breaks right across.

Ounalga Island is comparatively low, with red cliffs. The opposite coast of Ounalaska has dark cliffs, with a bright red horizontal vein in them. *English Bay*, on this coast, forms a good harbour.

OUNALGA PASS has depths of 25 to 35 fathoms in mid-channel, and is subject to occasional heavy squalls. The tides here run with great rapidity, averaging $6\frac{1}{2}$ knots, the flood setting North, and the ebb South; heavy tide-races are formed where the streams reach deep water. It is, consequently, advisable to use this channel only at or near slack water.

Pages 672, 674.—*Egg Islet*, or *Oungaljan*, lies off the North end of Biorika or Spirkin Island, with a depth of 35 fathoms between. The two low rocks, 4 or 5 miles to the southward, are known as the *Signals*, and there is a depth of 10 fathoms in the channel between them and the coast.

Page 673.—**OUNALASKA.**—**Captain or Iliuliuk Bay.**—A ridge of irregular soundings extends across between Pinnacle Rock, on the South side of Summer Bay, and the spit on the East side of Dutch Harbour. *Amognak* or *Amaknak Island* appears like a truncated pyramid at its North end, when entering the bay. The best anchorage is in about 16 fathoms, 2 cables north-eastward of the rocky islets at the entrance to Iliuliuk Harbour.

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Page 673.—**Iliuliuk Harbour** has a trading station on the coast, with a wharf. Coal and water may be obtained here, with limited quantities of preserved provisions. The only anchorage is in 10 fathoms, in the middle of the harbour, in line with the South side of the wharf. A *red spar buoy* marked the East end of a shoal off the eastern islet at the entrance, and a *barrel buoy* marked a $3\frac{1}{2}$ -fathoms shoal about 30 yards southward of the spar buoy. The narrow channel between these and the village has about 5 fathoms least water.

DUTCH HARBOUR has a trading station and village, with a custom-house, on its South side, off which a jetty extends 300 ft. into $3\frac{1}{2}$ and 4 $\frac{1}{2}$ fathoms water, and large vessels can lie alongside. About 1,000 tons of coal is stored here, and water can be obtained, with small supplies of preserved provisions. There is regular communication by steamer with Sitka.

It is high water, in Captain Bay, on full and change, at 3^h 50^m, and the extreme range of tide is 5 feet. There is, consequently, not much tidal stream in the harbours.

Directions.—In approaching Captain Bay, give a berth of at least $1\frac{1}{2}$ mile to Cape Kaleakhta, the shoals off which will be cleared when Priest Rock and the shore line to the southward are in line, but it is advisable to continue the same course until the South side of Summer Bay is open of the South head of Constantine Bay, when a S. $\frac{3}{4}$ E. course will lead towards Ulakhta Head, and may be followed until shortly after rounding Priest Rock, when the houses in Iliuliuk may be seen and steered for.

In entering Dutch Harbour, round Spithead at a distance of 100 yards, and anchor in 16 fathoms off the wharf. The best anchorage is nearer the western shore of the bay, and nearly opposite Spithead.

Page 673.—**Kaleakhta Bay**, eastward of Cape Kaleakhta, has a waterfall on its western side; at 3 miles eastward of the cape is *Erskine Point*, off which lies a rock somewhat similar to Priest Rock.

The *Bay of Otters*, or *Beaver Inlet*, lies between Biorka or Spirkin Island and the N.E. coast of Unalaska.

Page 674.—**Unalga Island, &c.**—See the Addenda for page 672.

In 1895, the South coast of Unalaska was reported to extend several miles farther South than shown on the chart, and, being fronted by rocks, it should be given a wide berth. About 5 miles within the S.W. end is an isolated conical peak, about 2,000 ft. high.

Chernofski Harbour is a deep inlet on the western coast of Unalaska, about 12 miles from the S.W. end. The entrance, between two low promontories, is nearly half a mile wide, and within there is sheltered anchorage for vessels of the largest size, in depths under 20 fathoms. In the northern angle of the bay is a village, with a white church, standing on a shingle isthmus separating this part of the harbour from the sea. No supplies could be obtained here, except wildfowl, salmon, and trout, and water could be had with difficulty from the stream running into the shallow southern angle of the harbour.

Directions.—In approaching from the northward, make *Cape Neil Juan*, a high, bold promontory. Chernofski church is about 3 miles south-west-

ward from this cape, and is a conspicuous mark; a deep cut in the cliff, about half a mile westward of the church, is also a good mark. Round East Point at a distance of not less than $2\frac{1}{2}$ cables, and steer in E.S.E. in mid-channel, and rounding the low shingle point at the S.E. extremity of the eastern promontory, anchor in 10 to 12 fathoms, mud, in mid-channel, midway between the point and the church.

Makushin or *Makouchinskoy Bay* has a village, with a white church, in the first inlet on the North side, off which there is good anchorage in 14 fathoms. *Makushin Volcano* rises to an elevation of 5,474 ft., at 6 miles to the N.N.W.

Page 675.—**OUMNAK.**—*Cape Sigak* is now considered to be in about lat. $52^{\circ} 42' N.$, long. $168^{\circ} 57' W.$, and to the S.S.W. of it is the low sandy island of *Samalga*, the channel between appearing dangerous. *Veevidoff Volcano* rises to an elevation of 7,236 ft., and there are no mountains between this and Cape Sigak, the land being hilly as far as Nikolski, and then lower to the cape.

At 6 miles north-westward of Cape Sigak is *Adugagh Island*, about 100 feet high, and vessels are recommended not to use the channel between, as there are numerous reefs, and the tides run strongly.

Nikolski, 14 miles N.E. by N. from Cape Sigak, is a village, with a church, off which there is anchorage.

Bogosloff Islands.—A depth of 755 fathoms has been found midway between these islets and the North coast of Oumnak, with no trace of the long reef reported. The islets are about 800 ft. high, $1\frac{1}{2}$ mile apart, N.W. and S.E., now separated by a navigable channel over the site of *Ship Rock*, which has disappeared. *New Bogosloff* or *Grewingk*, the N.W. islet, rose from the sea in 1882, but appeared almost quiescent in 1895; a low spit extends off the S.E. side, where landing may be effected. These islets are frequented by sea-birds and sea-lions, and, when several miles to leeward of them, a smell of sulphur and guano has been noticed. Constant changes in the sea bottom appear to be going on around them.

Page 675.—**Isles of Four Mountains** were examined in 1894 by the officers of the U.S. vessels *Concord* and *Corwin*. They are uninhabited, and, as stated by Lütke, are five in number, extending over an area of 29 miles, N.E. by N. and S.W. by S., the only known danger being a breaking reef reaching $1\frac{1}{2}$ mile south-eastward from the S.E. point of *Chuginadak*, the S.E. and largest island. At the western end of this island is a peak, rising to an elevation of 8,150 ft., the highest point of the islands. The tidal streams run strongly hereabout.

Younaska rises to an elevation of 2,864 ft., and, in 1895, was reported to be charted 4 to 5 miles N.W. of its true position. The tidal streams run with great violence in the channel between it and Amoughta. *Tchegoula Island* is 4,300 ft. high.

Amoughta rises to a peak, elevated 3,738 feet.

Page 677.—**FOX ISLANDS PASSES.**—See the Addenda for page 671.

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Page 677.—**ANDREANOFF ISLANDS**, and the islands westward of them, are only approximately shown on the chart. They are now uninhabited, though densely populated when first visited by the Russians.

Segouam, or *Signam*, is reported to have rocks and discoloured water extending $1\frac{1}{2}$ mile off its East and West ends.

Page 678.—**Atkha**.—*Nazan Bay*, W.N.W. of the West end of Amlia, affords anchorage in 10 fathoms; in its S.W. angle, sheltered by a group of islands and rocks, off the only village in the island.

Page 681.—**Goreloy** or *Burnt Island* rises in a peak, elevated 5,334 feet.

Amatignak Island rises to an elevation of 1,921 ft., and, in 1895, was reported to lie 4 miles South of its charted position.

Page 683.—**Bouldyr** rises to an elevation of 1,145 feet. Breakers have been reported at about 10 miles E. by N. $\frac{1}{2}$ N., and $12\frac{1}{2}$ miles S. by E. $\frac{1}{2}$ E., from its eastern end, as charted.

Agattou.—In 1855, the U.S.S. *Albatross* found anchorage in 15 fathoms, sand, about half a mile off shore, available in westerly winds, about 2 miles south-westward of the N.E. cape, with Cone Peak bearing N.W.

ATTOU rises to an elevation of 3,084 ft., near its centre. A dangerous 15-ft. rock lies in the fairway of the entrance to *Tschitschagoff Bay*, about $1\frac{1}{2}$ mile from the flagstaff, which appears in line with Range Point. Within this are numerous rocks, and the depth shoals to a bar of 2 or $2\frac{1}{2}$ fathoms, within which vessels can lie in 6 fathoms and under, off the village at the head of the bay. Good water can be obtained here.

Page 684.—**BEHRING SEA**.—See Addenda for p. 704. (Prybilov Islands).

Winds, &c.—In Behring Sea, southerly winds are said to prevail in spring, and northerly winds in the autumn. In summer, if the air be unusually clear, with a falling barometer, a strong S.E. gale, with rain, almost invariably follows. The currents depend much upon the prevailing winds, the set being chiefly to the northward.

Ice.—In winter, according to a report issued by the U.S. Hydrographic Office, the general contour of the southern ice limit in Behring Sea is from Bristol Bay to about 35 miles southward of the Prybilov Islands, and then to the N.W. towards Cape Omensky. Many years ago, ice is said to have descended to Ounalaska, and in January, 1878, it reached Ounimak Pass and Akoutan Island. In some seasons, no ice is seen at the Prybilov Islands, where broken floe ice is usually found from December to May. Heavy solid ice is not met with far southward of St. Matthew Island.

At St. Michael's, Norton Sound, ice ceases to form at the beginning of May, but vessels are not expected to reach the settlement till June 10-15; the earliest recorded arrival was May 25, 1875. Navigation is again closed about the middle of October.

Page 685.—**Amak Island** is 1,682 ft. high, and its South end is now considered to be in long. $163^{\circ} 7' 30''$ E. Rocks extend from it to *Sivoutchy Rock*, and dangers are said to reach 5 miles eastward of its South end.

Page 686.—**MOLLER BAY.**—The S.E. angle is known as *Herenden Bay*, and on its eastern shore is a deposit of bituminous coal, which has been worked. (See the Addenda for Portage Bay, page 667).

Page 688.—**BRISTOL BAY.**—Large salmon canneries have been established near the trading station of *Tahlekuk* or *Fort Alexander*, on both sides of the entrance of the *River Nouchagak*. The approaches are encumbered with shoals, but good pilots can be obtained to take vessels inside. *Cape Constantine* is now considered to be in lat. $58^{\circ} 25' N.$, long. $158^{\circ} 40' E.$

Round Island lies 11 miles off shore, and midway between it and *Hagemeister Island* is a group of islands and rocks, apparently connected with the latter island by shoal water. There is a passage northward of these to *Togiak Bay*, which can also be approached by the channel westward of *Hagemeister Island*. A 3-fathoms shoal lies about 5 miles S.W. by W. from the southern end of this island.

Page 689.—**Kuskoquim River** is navigable for vessels of shallow draught for about 500 miles from its mouth. The tide is said to rise 50 ft. in its entrance, which is filled with mud-flats at low water, and here is a great salmon fishery in the summer. There are numerous villages and trading stations on its banks.

Pages 689-690.—**NUNIVAK ISLAND** rises to an elevation of about 500 feet, and is said to be incorrectly delineated on the charts. It is covered with grass, being bare of trees, and its shores are mostly low, with occasional cliffs 100 to 150 ft. high. The coast consists of shallow bays, between low rocky headlands, fronted by islets and reefs reaching some miles seaward, and breaking heavily. There is a lagoon at its southern end. In 1890, the inhabitants numbered about 700. In 1897, Captain Higgins steamed along the S.W. coast, and found the distance by log to be 53 miles between the S.E. and N.W. points. *Cape Etoline* is in about lat. $60^{\circ} 25\frac{1}{2}' N.$, long. $166^{\circ} 8\frac{1}{2}' W.$, and on it is the village of *Koot*, the principal place in the island. There are said to be several reefs between the island and the coast, and the tides run strongly in this channel. Depths of $4\frac{1}{2}$ to 9 fathoms are said to extend 12 to 15 miles off the West coast, and breakers have been seen 6 or 7 miles off the southern extremity of the island. A shoal, 3 miles long, with 10 ft. over it, is reported to lie 5 miles off the N.W. coast.

In 1889, Capt. Smith, of the *Balena*, reported a $2\frac{1}{2}$ -fathoms shoal about 12 miles South of the principal peak of Nunivak, and was of the opinion that this shoal extends to the north-westward along the coast of the island.

Southward of *Cape Vancouver* is the village of *Dumunuk*, with a mission station and trading store.

Pages 691-692.—**YUKON RIVER**, as already stated on page 1, forms the easiest but longest means of approach, both for passengers and cargo, to the goldfields around the upper part of its course. Considerable attention has been given to this river by the Canadian and United States surveyors, so that this region is now fairly well known. Taking either the

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Pelly River or Lewis River as its source, its length is estimated to be from 2,500 to 2,800 miles, of which 2,300 miles are navigable by river steamers. At the junction of the Pelly and Lewis Rivers, about 1,850 miles from the mouth, the river is about three-quarters of a mile in width, and this can be reached by 400-ton stern-wheel vessels, drawing 4 ft., and smaller vessels can ascend 300 miles beyond this, to Lake Teslin (see the Addenda for page 602). At Fort Yukon, near the Arctic Circle, the river is about 8 miles in width. *Dawson City*, at the mouth of the famous *Klondyke River*, is about 1,570 miles up the Yukon, and is reached by the steamers from St. Michael's in from 14 to 16 days.

The river delta has a sea-face of about 100 miles, and there is no known suitable location for a town at its entrance, owing to the land being all overflowed annually on the breaking up of the ice. Neither is there any safe anchorage off it, owing to the wide extent of shallow and uneven ground. Ocean-going vessels, consequently, transfer their passengers and cargo at St. Michael's into the river steamers.

The head of the delta is about 100 miles from the sea, and for some 200 or 300 miles above this the river is many miles in width, appearing like a sea of yellow water.

The *Aphoon Mouth*, about 80 miles southward of St. Michael's, still remains the only approach to the main stream, and is said to have only 8 ft. water in it. It is narrow and intricate, and easily to be distinguished by the trees on its banks, whereas the other mouths are wider but shallower, with little or no vegetation, and blocked by bars and driftwood.

Ice.—As a rule, it is not safe to enter Norton Sound much before July, on account of the ice, which forms again early in October. In 1889, drift-ice was met with off the northern shore so late as July 11. The position of the ice depends greatly upon the prevailing wind and the current from the river, and the ice is sufficiently heavy to require caution on the part of vessels not fitted to encounter it. (See, also, the Addenda for page 684).

Mr. Ogilvie, the Canadian surveyor, states that the river does not become open for navigation before July 1, as a rule, and becomes frozen up again by October 1.

Tides.—In Norton Sound the usual range of tide is about 3 ft., but it is much affected by the winds; a strong gale from the southward may cause a rise of 8 to 10 ft., while a strong northerly gale may cause a fall of the same amount.

Page 692.—**Stuart Island** is said to be incorrectly delineated upon the chart, and has a low flat-topped hill in its centre.

On August 27, 1897, Captain J. F. Higgins reported that his steamer *Excelsior* grounded on a shoal of hard sand, with 10 ft. least water, about 40 miles westward of Stuart Island, or in lat. $63^{\circ} 42' N.$, long. $164^{\circ} 10' W.$ It continued shallow for 3 miles to the N.W., but deepened quickly to the eastward and N.E. He considered it to have been recently formed, probably by the action of ice.

Capt. Higgins gives his opinion that it is not safe to pass in or out of Norton Sound, South of the parallel of $64^{\circ} N.$ To East of long. $164^{\circ} W.$ in

the sound, there is no greater depth than 10 fathoms, and between Golovnine Bay and Stuart Island there are spots with only 7 fathoms on them. He also states that North of the Yukon, on the line of the immense body of ice which passes out of the river, the bottom changes from year to year, and is very lumpy, he having found, in June, 1897, while dodging along the ice, spots with but 17 ft. on them, alternating with depths of 6 fathoms. He has seen large ice floes aground in 8 and 9 fathoms, and, with the water full of sand during the spring and summer freshets, a shoal can be quickly formed about one of the floes. Between the mouth of the Yukon and Cape Nome, the soundings may be expected to vary considerably from year to year.

Pages 692-693.—**ST. MICHAEL'S** has now become a very busy place during the open season, from June to October, but there is no harbour, in the proper sense of the word, the anchorage being unsafe in bad weather, both from want of protection and the shoal water. The depth at the usual places of anchorage ranges from 3 to $4\frac{1}{2}$ fathoms, the latter depth being at a distance of $1\frac{1}{2}$ mile from the landing. When a sea arises, vessels find it often necessary to shift anchorage farther out, or leave altogether.

Directions.—In addition to Capt. Higgins' advice, as given above, we here give the directions recommended by the officers of the U.S.S. *Thetis*, in 1890:—In approaching Norton Sound and St. Michael's, from the southward, a good berth should be given to the mud-flats and shoals making out from the delta of the Yukon. Vessels should keep outside the depth of 7 fathoms, as it shoals rapidly, and there are lumps reported as forming. The best course is to steer for Cape Nome, from a position between Cape Smith and the S.E. cape of St. Lawrence Island. When within 10 miles of Cape Nome, stand to the eastward along the northern shore, until Cape Darby is sighted, and then steer for Egg Island, off St. Michael's.

The best guides for St. Michael's and its anchorage are Egg Island and two low rounded mountains, or hills, known as the *Sisters*. *Egg Island* is a small low flat island, sloping from a moderate bluff to a low point at the eastern extremity. The general course from Egg Island to St. Michael's anchorage is *S. 36° W.* (true), and the bearing of the Sisters from Egg Island is *S. 8° W.* The soundings from Egg Island to the usual anchorage run very evenly; 7 fathoms is found off the island, decreasing to 6 and then 5 fathoms, until the anchorage is reached, 8 miles distant from Egg Island, with a depth of $4\frac{1}{2}$ to 4 fathoms, mud.

In 1896, the U.S. surveyors reported there was from 3 to 6 ft. less water in the harbour than shown on the chart.

Page 694.—**Golovnine Bay.**—In 1893, the steamer *Bertha* anchored in 4 fathoms, close westward of an islet, on the East side of the bay, 7 or 8 miles within Cape Darby. On *Fish River*, 40 miles from the sea, is a deposit of silver-lead ore.

Page 695.—**Aziak**, or *Sledge Island*.—The U.S.S. *Thetis* found a least depth of $6\frac{1}{2}$ fathoms in the channel between this island and the coast.

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Page 696.—**PORT CLARENCE** is now largely used by the Arctic whalers, who here await the annual visit of the relief steamer from San Francisco. The *Thetis* found the best anchorage in $4\frac{1}{2}$ fathoms, just inside Point Spencer, and under the lee, in case of southerly winds, of a shoal spit from the main spit of the point. The holding ground is good, mud and fine sand, and there is good protection from northerly winds, but poor from southerly and westerly gales. There is some little range of tide, which varies with the wind as in Norton Sound. Fresh water can be obtained.

Grantley Harbour will admit vessels drawing less than 12 feet.

Directions.—In thick weather, the spit of Point Spencer is not easily distinguishable. In coming from the southward, the safest course is to steer for Cape York, giving the coast a berth of at least 2 miles, and then keep along shore to the eastward to the entrance of the harbour.

Page 700.—**Icy Cape**.—In 1889, a mast beacon, 26 ft. high, was erected by the crew of the U.S.S. *Thetis*, about $3\frac{1}{2}$ miles S.W. of the cape. It was found that the S.W. side of *Blossom Shoals* extended about 2 miles farther off shore, and $2\frac{1}{2}$ miles farther to the S.W., than shown on the chart. The beacon bearing S. 36° E. (true) leads clear of the S.W. side.

Page 700.—**POINT BARROW**.—In 1890, Capt. Smith, of the whaler *Balena*, reported that *Owen Shoal*, of $3\frac{1}{2}$ fathoms, shown on the charts at about 10 miles N. $\frac{1}{2}$ E. from this point, does not exist. Vessels eastward of this point, after the first week in September, must be prepared for wintering.

In 1889, Capt. McGregor, of the whaler *Narwhal*, reported a 12-fathoms bank, in lat. $71^{\circ} 54' N.$, long. $161^{\circ} 10' W.$, and considered there was shoaler water farther westward.

Page 701.—**Herald Island**.—In 1889, Capt. Whiteside, of the whaler *Lucretia*, reported that his vessel was lost on a reef extending from the western end, at a point 6 miles S.W. by W. from the northern extreme, and the reef appeared to extend much farther westward.

Page 702.—**ST. LAWRENCE ISLAND** consists of granitic rocks, with a few patches of moorland and grass. The natives numbered 267 at the census in 1890; they subsist by the chase of bear, fox, reindeer, seal, &c. In 1888, Capt. Smith, of the *Balena*, reported a shoal of 3 fathoms, or less, off the S.E. cape.

Page 703.—**ST. MATTHEW ISLAND** is uninhabited. It appears to be almost constantly enveloped in fog, and has a cheerless and inhospitable aspect, the climate being cold and damp. Heavy ice is met with in its vicinity, drifting on to it with the prevailing winds. When visited by the U.S.S. *Thetis*, in June, 1889, no bears were seen, only a few foxes, with snipe and duck. Fresh water is abundant.

The range of tide is about 4 ft., and the streams run from 1 to $2\frac{1}{2}$ knots an hour, flood to the eastward, and ebb to the westward.

Cape Upright has a solitary rock, about 25 ft. high, off its extremity. The *Thetis* anchored in $12\frac{1}{2}$ fathoms, sand, in the bight westward of the

first high headland north-westward of Cape Upright, giving a good berth to the low rocks off the headland. Here there is good protection from southerly winds between S.W. and S.E., and landing can be effected on the beach. In the vicinity are some lakes of fresh water.

With northerly winds, anchorage can be obtained off the South side of the island.

A small islet was shown on some charts about 8 miles northward of the eastern part of the island, but its existence is extremely doubtful.

Page 704.—*Hall Island* is frequented by sea-birds, and there is anchorage in the bight on its East side. *Sarytcheff Strait* is said to be clear of danger, but there are rocks on either side. The tidal streams run strongly in this vicinity.

Pinnacle Island, as seen from the eastward, appears like two rounded hills, with small pinnacle rocks off the N.W. end.

Page 704.—**PRYBILOV ISLANDS** have been the focus of much contention between the British and United States authorities regarding the pelagic or deep-sea seal fishery. The Russian and American Governments practically contended that Behring Sea belonged solely to those two nations, but, on this question being submitted to arbitration, the arbitrators, assembled at Paris, on August 15, 1893, decided mainly in favour of Great Britain, this sea being declared open to the vessels of all nations. Thus, neither Russia nor the United States have by right any exclusive privileges beyond the limits of the usual marine league from their shores.

The British and American Governments, however, have agreed to altogether prohibit the chase of the fur-seal within a zone of 60 geographic miles from any part of the islands; and it is also forbidden from May 1 to July 31, both inclusive, over the wide area bounded on the South by the parallel of 35° N. from the coast as far as the meridian of 180° , and on the West by this meridian as far North as $60^{\circ} 40'$ N., whence the boundary is a line to lat. $65^{\circ} 30'$ N., long. $168^{\circ} 45'$ W., in Behring Strait, and thence on this meridian to the northward. In the open season, only sailing vessels may be employed in this pursuit.

Both nations employ cruisers to prevent infraction of these regulations, the object of which is to avoid the extinction of these animals, by affording them a close time during the breeding season.*

In May, 1890, the U.S. Government granted a 20 years lease of the right to kill seals on these islands to the North American Commercial Company, the annual take being limited to 100,000 skins, or 75,000 on St. Paul Island, and 25,000 on St. George.

There are several anchorages around the islands, but vessels should not attempt to ride out a gale, unless lying to leeward, and well sheltered. A

* By an Act of Congress, dated December 29, 1897, citizens of the United States are prohibited at all times from the chase of the fur-seal in the waters of the Pacific Ocean North of the parallel of 35° N., including Behring Sea and the Sea of Okhotsk. This Act, however, does not apply to the regulations concerning the taking of seals on the Prybilov Islands.

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heavy surf soon rises on the weather side with such winds, rendering landing difficult or dangerous.

Tides, &c.—The currents around the islands are very strong and uncertain, being greatly influenced by the wind. It is high water, on full and change, at about 5^h 30^m, and the range is about 3 feet. Normally, the flood stream sets eastward, and the ebb westward, with a maximum surface rate of 2½ knots, but below the surface it has been found to run much faster.

Pages 705-706.—**ST. GEORGE ISLAND** should not be approached within a depth of 12 fathoms. *Dalnoi Point*, the western extreme, is a precipitous cliff, and tide-rips are sometimes met with off it. *Zapadniy Bay* affords good shelter from E.N.E. winds; a reef extends about 2½ cables off its southern shore. The village, on the North coast, contained 93 inhabitants at the census in 1890, and is now considered to be in lat. 56° 36' 30" N., long. 169° 32' 15" W.; a red house in line with the flagstaff leads to the anchorage off it. The beach is fronted by thick kelp, and landing is only possible with smooth water, when a flag is shown on the flagstaff.

In 1894, the U.S.S. *Concord* anchored on a patch of 17 fathoms, sand, 7½ miles N.E. by E. ¾ E. from Tolstoi Point, the western extremity of the island. A 3-fathoms patch, with kelp on it, has also been reported to lie about 9 miles eastward of the same point.

Two islands have been reported to lie to the southward and south-westward of the Prybilov Islands, but their existence is so extremely doubtful that they have been removed from the charts.

Page 706.—**ST. PAUL ISLAND** is 12 miles in extent, N.E. and S.W., and 4 miles across where widest, rising at its western end to an elevation of 633 feet. At the census in 1890, the village contained 244 inhabitants, of whom only 22 were whites. Under favourable conditions, boats can land in Village Cove, northward of the village near the southern point, or on the shore near Black Bluffs, eastward of the village; also at the western extremity of Lukannon Bay, and on both sides of the island, abreast Cross Hill.

Hutchinson Hill, the N.E. extreme of the island, is connected with it by a low narrow isthmus, known as *Sea Lion Neck*. The hill is fronted by rocks, marked by kelp; one, of 3 fathoms, lies nearly 1 mile N. by W. ¼ W. from the shore, and another 1¼ mile E.S.E. of the eastern point. In 1895, a depth of 7 fathoms was found off the North shore, about 3 miles S.W. by W. ¾ W. from the hill, and there may be less water hereabout.

Reef Point is now considered to be in lat. 57° 6' 30" N., long. 170° 20' W., and should be very cautiously approached in thick weather. Masters of passing vessels are requested not to disturb the seals here by firing guns, or making any unnecessary noise.

The usual anchorage is in *English Bay*, in 10 to 4 fathoms, off Village Cove, or off Black Bluffs, according to the wind. A flag is shown on the side an approaching vessel should anchor, and is then hauled down if landing be unsafe. There are other anchorages around the island, as shown on the chart.

S. W. Point has a reef extending about 1 mile off it, and just to the eastward of it are some remarkable white patches on the cliffs.

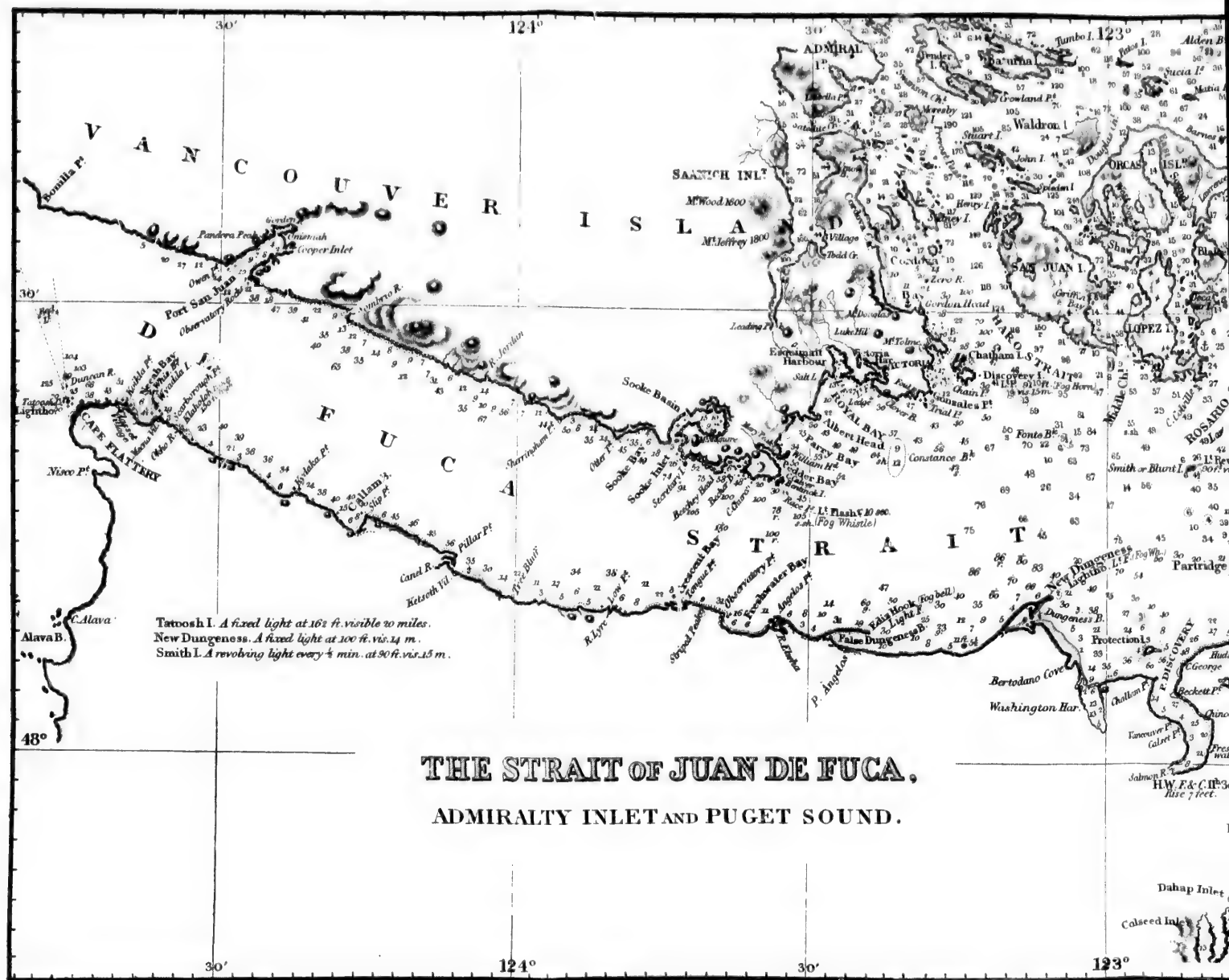
Otter or *Bobrovi Island* has two small craters on its East end, whence the land rises gradually to its West end, which is high and cliffy. Foul ground, with breakers, extends from 5 to $7\frac{1}{2}$ cables around its western part, its North side being clear of danger. There is anchorage in $9\frac{1}{2}$ fathoms, sand, about half a mile N. by W. from Crater Point. In 1893, the U.S.S. *Albatross* made an unsuccessful search for the breakers reported to lie between this island and Reef Point, a depth of 26 fathoms being found at $1\frac{1}{2}$ mile N. by E. from the island.

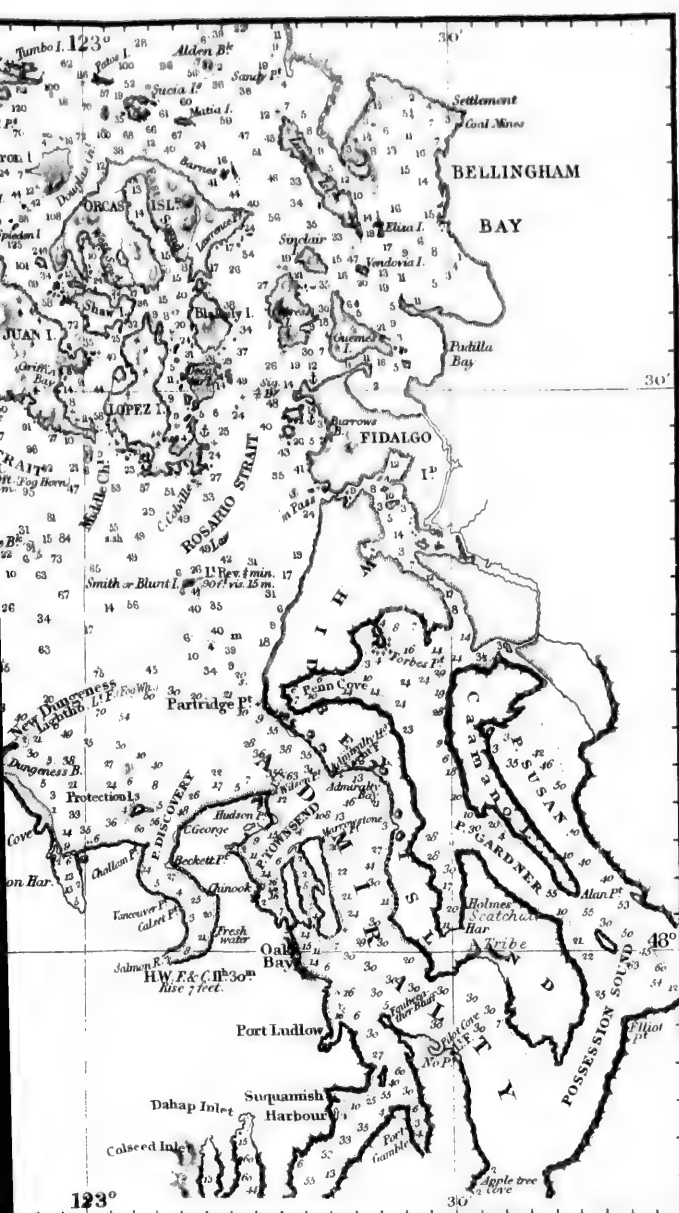
Page 707.—*Morjovi* or *Walrus Island* has a breaking reef extending about $2\frac{1}{2}$ cables South of it. This and *Otter Island* must be very cautiously approached in thick weather.

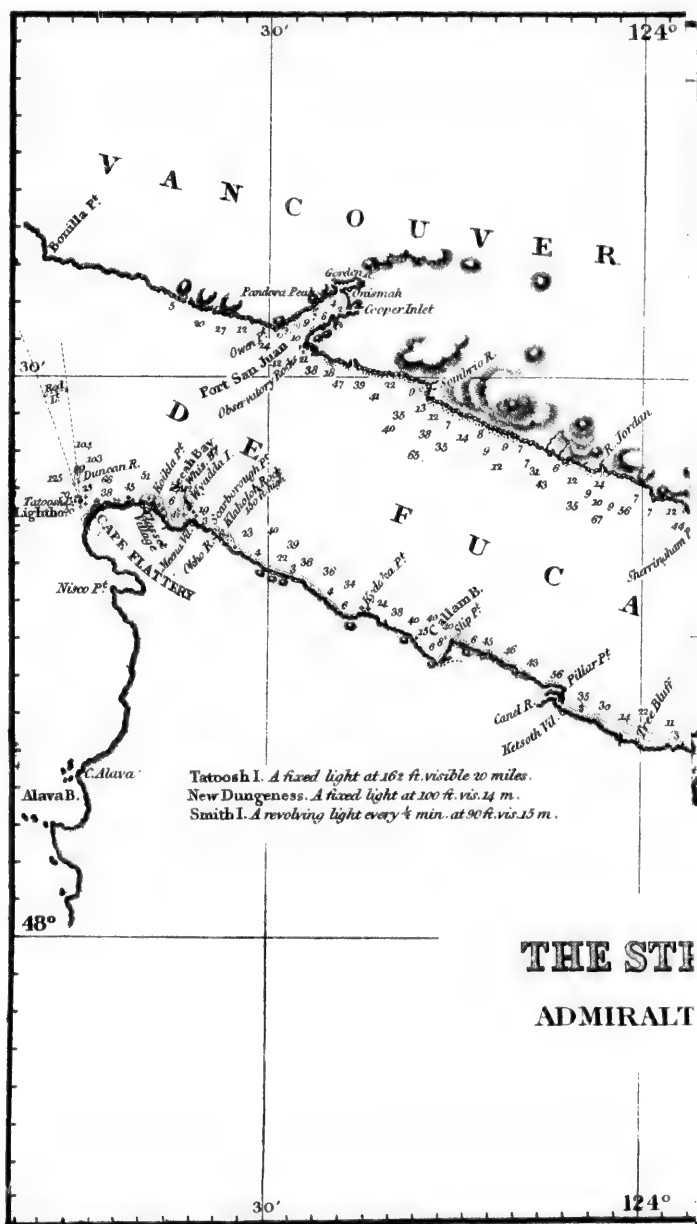
Offlying Reefs.—In 1895, the U.S.S. *Corwin* found a depth of 35 fathoms in the position of the 5-fathoms shoal said to lie $7\frac{1}{2}$ miles westward of the high bluff at the western end of St. Paul Island. Overfalls and swirls were noticed hereabout.

In 1894, the U.S.S. *Ranger* made an unsuccessful search for the kelp bank said to lie about 16 miles E.N.E. of Hutchinson Hill, depths of 28 to 34 fathoms, sand, being found around the given position.

The rock or shoal, said to lie about 90 miles N.E. by E. $\frac{1}{2}$ E. from the N.E. point of St. Paul Island, was searched for in vain by the U.S.S. *Thetis* in 1889, and other authorities also deny its existence.







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family. The numerous streams emptying upon the coast afford them a never-failing supply of the finest salmon; and to obtain means of barter with white traders, they fearlessly attack and capture the different species of whale on the coast.

THE STRAIT OF JUAN DE FUCA.

The discovery of this important strait was the subject of much controversy. It was attributed, in a narrative published in Purchas's *Pilgrims*, to a Greek pilot, known as Juan de Fuca, but whose real name was Apostolos Valerianos. He related that he found, in 1592, a channel here leading from the Pacific into the Atlantic, which was then named the Strait of Anian. Much doubt was thrown on this statement, and, by a singular fatality, its entrance was passed unperceived by Cook and others, so that these uncertainties seemed to be confirmed, and the strait was not re-discovered till Capt. Kendrick entered it in the American sloop *Washington*, in 1789. It was well surveyed by Captain George Vancouver in 1792, and the very singular character of the inlets diverging from it to the S.E. was then first ascertained. The shores of the strait were surveyed by Captain (afterwards Admiral) H. Kellett, in the *Herald*, in 1847, and to the S.E. of the strait, Vancouver's work was re-examined by Commodore Wilkes, U.S.N., who found but little to correct. More complete surveys of some of the ports, &c., have been made by the officers of the U.S. Coast Survey, since their occupation of Washington Territory, and it is to the last-named authorities that we owe most of the subsequent description of the South side of the channel, leaving that of the opposite shore of Vancouver Island for the ensuing chapter. We have also derived some of the following from the accounts given by Capt. G. H. Richards, R.N., and from various other sources up to the present time.

From its geographical position, the strait is liable to all those sudden vicissitudes of weather common to high northern latitudes; and in few parts of the world is the caution and vigilance of the navigator more called into action than in entering it.

The breadth of the strait between Cape Flattery, its southern point, and Bonilla Point, Vancouver Island, its northern, is 13 miles; within these points it soon narrows to 11 miles, and carries this breadth on an East course for 40 miles, or until Race Islands bear N.E. by E., distant 10 miles; it then takes an E.N.E. direction for a further distance of 14 miles to the shore of the continent, or more properly Whidbey Island.

Between Race Islands and the southern shore the breadth of the strait is 8 miles, after which it immediately expands to 17 miles, leading northward to *North Pacific*.

the British possessions by various channels among the labyrinth of islands known as the Haro Archipelago, and southward to those of the United States, by Admiralty Inlet and Puget Sound.

The coasts of Juan de Fuca Strait are bold, abrupt, and covered with a heavy growth of timber and bush. They are remarkably free from danger, and may be approached safely within half a mile; but there is one breaking rock which lies nearly that distance off the West point of Crescent Bay on the southern shore. The soundings in the centre are of great depth, but within $1\frac{1}{2}$ mile of either shore there is generally under 40 fathoms. On both sides of the strait there are several anchorages or stopping places which may be taken advantage of by vessels, either inward or outward bound, when meeting with adverse winds. Rocky shoals and dangers are usually well marked by kelp.

On the northern or Vancouver Island shore of the strait the hills rise gradually, and are densely wooded, but near the coast attain to no great elevation. On the southern side the almost perpetually snow-clad mountains, known as the Olympian range, rise more abruptly, and vary in elevation from 4,000 to more than 6,500 ft.; but, though exceedingly grand in their rugged outline, present no very marked summits as seen from the strait, nor any great variety in their features.

Tides.—It is high water at Cape Flattery, on full and change, at noon and at midnight. In the outer part of Juan de Fuca Strait there is no very great strength of tide; it varies from 1 to 4 knots, seldom so much as the latter, unless near Cape Flattery; but when approaching the more contracted part in the neighbourhood of Race Islands, which receives the first rush of the pent-up waters of the Strait of Georgia, strengthened and diverted by the labyrinth of islands which choke up its southern entrance, it is not surprising that eddies, races, and irregularities occur, which almost baffle any attempt at framing laws which may not rather embarrass than assist the seaman. The result, however, of observations continued throughout an entire year at Esquimalt, and partially on other parts of the coast during three seasons, appears to warrant the following conclusions, viz.:—

The flood tide sets to the northward along the outer coast of the continent and Vancouver Island. It enters the Strait of Juan de Fuca at Cape Flattery, running with considerable velocity, sometimes 3 or 4 knots over Duncan and Duntze Rocks; it then turns sharply into the strait, passing through the various channels among the Haro Archipelago into the Strait of Georgia, and within about 5 miles of Cape Mudge, where it is met by the flood from the northward, which, sweeping the western coast of Vancouver Island, enters Goletas Channel and Queen Charlotte Sound at its northern extreme, in lat. 51° , thence southerly down the narrow waters of Johnstone Strait and Discovery Passage, meeting the tide which enters by Fuca Strait, and reaches about midway between the northern and southern extremes of Vancouver

Island, or close to the spot where the broad expanse of the Strait of Georgia merges into the narrow channels adjoining it.

On the western side of the island the tides were found to be regular, nor is any marked irregularity observable in Johnstone Strait and Discovery Passage. The great and perplexing tidal irregularities may therefore be said to be embraced between the Strait of Fuca, near Race Islands, and Cape Mudge, a distance of 150 miles; and a careful investigation of the observations made at Esquimalt, and among the islands of the Haro Archipelago, shows that during the summer months, May, June, and July, there occurs but one high and one low water during the 24 hours, high water at the full and change of the moon happening about midnight, and varying but slightly from that hour during any day of the three months; the springs range from 8 to 10 ft., the neaps from 4 to 5 ft. The tides are almost stationary for two hours on either side of high or low water, unless affected by strong winds outside.

During August, September, and October, there are two high and low waters in the twenty-four hours; a superior and an inferior tide, the high water of the superior tide varying between 1^h and 3^h a.m., the range during these months from 3 to 5 ft., the night tide the highest.

During winter almost a reversal of these rules appears to take place; thus, in November, December, and January, the 12-hour tides again occur, but the time of high water is at or about noon instead of midnight.

In February, March, and April, there are two tides, the superior high water occurring from 1^h to 3^h p.m. Thus it may be said that in summer months the water is low during the day, and in winter low during the night.

The ebb stream has always been found to run southward through the Haro Archipelago, and out of Fuca Strait for 2½ hours after it is low water by the shore, the water rising during that time; the ebb is stronger than the flood, and generally two hours longer duration.

The tides during those months, when two high and two low waters occur in the twenty-four hours, are far more irregular than when there is only one 12-hour tide, and another anomaly exists, viz., the greatest range not unfrequently occurs at the first and last quarters, instead of at the full and change of the moon.

Some remarks on the Winds, Currents, &c., will be found in Chapter VI, at the commencement of the description of Vancouver Island.

Soundings.—Between the parallels of 48° and 49° the 100-fathoms bank extends for 32 miles off shore; and for 5 or 6 miles on either side of the parallel of 48° 30', which passes through the centre of Juan de Fuca Strait, no greater depth than 55 fathoms is found at the distance of 40 miles from the entrance. Steering for the strait within these limits of latitude, viz., a few miles on either side of 48° 30', from 55 to 60 fathoms will be carried for 20 miles, the bottom fine dark sand, sometimes varied by gravel and small stones, when it will deepen to 80 and 90 fathoms, generally muddy bottom, for a farther distance of 10

miles; a vessel will then be within 8 or 10 miles of the strait: if to the northward of $48^{\circ} 30'$ the water should shoal to 36 and 40 fathoms, rocky or gravel bottom; if to the southward it will continue deep, and will increase to more than 100 fathoms, when within 8 or 9 miles of Cape Flattery.

The outer edge of the bank is rather steep, falling from 90 to 150 fathoms, and then no bottom with the ordinary line. There is one peculiarity which should not pass unnoticed; the deep channel of over 100 fathoms, which runs through the centre of the strait, on entering the ocean is deflected to the southward, probably owing to the superior strength of the ebb stream and the southerly current, and a zone of deep water about 3 miles in width, with from 140 to 150 fathoms, extends in that direction to the 48° parallel; between it and the shore, a distance of about 8 miles, the depth decreases suddenly to 30 fathoms, fine dark sand, and immediately outside it from 67 to 80 fathoms will be found.

Mr. George Davidson, of the U.S. Coast Survey, states that during dry summers the Indians and settlers set fire to the forests in every direction, and the country soon becomes enveloped in a vast smoke, which lasts for two or three months. At such times it is frequently impossible to make out the shore at half a mile distance.

In summer the prevailing wind draws into the strait, increasing towards evening, and frequently blowing a 10-knot breeze before midnight; but, unless the wind is strong outside, little is felt in the strait, and very frequently sailing vessels are a week from Cape Flattery to Admiralty Inlet, or vice versa. In winter the S.E. winds draw directly out, and create a very heavy cross-sea off the entrance, the great S.W. swell meeting that rolling out. In such cases trading vessels try to gain Nee-ah Bay or San Juan Harbour, and remain at anchor until the wind changes. In beating in or out, vessels may run as close under either shore as winds and currents warrant.

Directions.—Vessels bound for Fuca Strait from the southward or westward, except the coasting steamers which all carry pilots, should make Cape Flattery; there is no inducement to hug the coast, on which a long rolling swell frequently sets; and this swell, meeting the south-easterly gales of winter, causes a confused sea. The cape and its off-lying rocks should not be approached within a distance of at least 3 miles. It is equally necessary, either in entering or leaving the strait, to avoid the Vancouver coast between Port San Juan and Bonilla Point, when there is any appearance of bad weather.

It is recommended to pass at the distance of at least 10 miles from the coast, unless working to windward against a fine northerly wind, when it may be safely approached within 3 miles.

To vessels making the strait in bad weather, it will be more desirable to run in and seek shelter than to remain outside. If the land has been made on either side, within a moderate distance of the entrance, or if the latitude can be relied upon within 2 or 3 miles, it will be advisable to run for the strait. The

powerful light on Tatouch Island, off Cape Flattery, will, unless in very thick weather, be seen at a considerable distance, and as soon as a vessel is actually within the strait she will have comparatively smooth water, with sufficient sea room, and may either run boldly up the centre for the light on Race Islands, or maintain her position in the entrance by the assistance of Tatouch Island light. The latter light becomes shut in by the land when bearing westward of W.S.W., and Race Islands light is obscured by Beechey Head when bearing eastward of E. by N. $\frac{1}{4}$ N.

In approaching from the westward with a heavy westerly or N.W. gale, thick weather, and uncertain of the latitude, it would be prudent to lay by at not less than 30 miles from the entrance to the strait, or on the edge of the bank of soundings. These gales seldom last more than 12 hours, and if they veer towards the S.W., the weather will clear, and a vessel may immediately bear up for the strait.

With a S.E. gale it is recommended to close the land, smoother water will be obtained, and the bank of soundings off the Vancouver Island shore will give a vessel pretty accurately her distance from the land. Gales from this quarter sometimes continue in the winter season for 30 hours, and when a vessel strikes soundings on the edge of the bank in 90 fathoms and carries them into 60, she may put her head to the S.W., and will have plenty of room for drift.

It is of great importance in making the strait during bad weather to strike the outer edge of the bank of soundings, as the ship's distance from the land will then be accurately known. It has been already observed that after running 20 miles eastward the depth increases from 55 to 90 fathoms, which, if the lead has not been kept previously going, might be mistaken for the outer edge.

Should a sailing vessel be overtaken by a dense fog, she should not close the land, but stand off sufficiently far to avoid being set by the southerly current too near Cape Flattery. A steamer, having sighted the light or land, and certain of her position, should get the Vancouver shore aboard, and may feel her way in by the chart and lead. At 8 or 10 miles eastward of Port San Juan there is anchorage in 12 fathoms, a mile from shore, and if the fog is very dense a stranger should anchor. It must be remarked, however, that not unfrequently the weather is clear a few miles within the strait, while the entrance is totally obscured.

CAPE FLATTERY or **Classet** is a remarkable point of land, and distinctly seen at a distance of 35 miles, rising gradually from the sea to a thickly-wooded mountain nearly 2,000 ft. high, with an irregular shaped summit, and falling again at the distance of 3 or 4 miles to the eastward. When seen from the southward or S.W. it has the appearance of an island, being separated by a stretch of low land from hills of the same or greater elevation, which rise again immediately southward of it.

On a nearer view, the headland itself, with its wild off-lying rocks, over which the sea is almost constantly breaking, presents no inviting appearance. It is a rugged sea-worn cliff, about 100 ft. high, and rising gradually to its more prominent feature, a densely wooded mountain. From the cape the coast trends E.N.E. for 4 miles to Neeah Bay, and though no positive dangers exist half a mile from the shore eastward of the cape, there is generally a heavy swell with irregular tides, and vessels are by no means recommended to approach it within a mile. The current sometimes runs 3 knots an hour.

Tatouch or Tatoosh Island, lying W.N.W. half a mile from Cape Flattery, consists of several small rocky islets, bare of trees, and connected by reefs. It is half a mile in length W.N.W. and E.S.E., and rises to a height of 108 ft., the sides being perpendicular. A reef is said to extend a quarter of a mile off the West side. Between it and the cape there is a reef, on which the sea breaks heavily in bad weather. A leaning rocky column, about 140 ft. high, and 50 ft. in diameter, is seen to the S.E. close under the cape. It is sometimes called De Fuca's Pillar or Pinnacle Rock.

The **LIGHTHOUSE**, known among seamen as Cape Flattery light, stands on the summit of Tatouch Island, which, with its outlying reef, is the most western portion of the United States. It consists of a keeper's dwelling of stone, with a tower of brick, whitewashed, 64 ft. high, and shows a *fixed bright* light of the first order, elevated 162 ft., which in clear weather should be seen from a distance of 19 miles, so that a vessel from the southward will make it before being up with Flattery Rocks. In foggy weather a steam *Fog Whistle* sounds a blast of 8 seconds at intervals of 52 seconds. Its position is lat. $48^{\circ} 23' 15''$ N., long. $124^{\circ} 44' 40''$ W.

Duncan Rock, rather more than a mile N.W. by N. from Tatouch Island lighthouse, is a small low black rock, a few feet above water, but the sea always breaks over it. There is deep water between it and the island, but vessels are recommended not to take the passage unless compelled to do so.

Duntze Rock, with 3 fathoms water on it, lies about a quarter of a mile N.W. by N. from Duncan Rock, and frequently breaks. Sailing vessels are recommended not to approach the lighthouse on Tatouch Island nearer than 3 miles. In the immediate neighbourhood of Cape Flattery, and among these rocks, the tides are strong and irregular.

NEEAH BAY.—From Cape Flattery the coast trends 4 miles E.N.E. to *Koiltah* or *Koikla Point*, on the West side of Neeah Bay; the shore is high and rugged, backed by hills 1,500 to 2,000 ft. high, covered with timber. Deep water is found within one-third of a mile of the bluffs. The bay is $1\frac{1}{4}$ mile wide between Koiltah Point and the North end of Wyadda Island to E. by N. $\frac{1}{4}$ N., and extends about $1\frac{1}{4}$ mile to the S.S.E. The western shore of the bay is high and cliffy, and bordered by craggy rocks 300 to 400 yards off. A reef extends for more than a cable off Koiltah Point, and within the point a sand bank, which dries, extends off a quarter of a mile at low water. The

head of the bay is a low sandy beach, on which there is generally some surf rolling, and backed by woods.

Wyadda or *Waaddah Island*, forming the East side of the bay, is a high, narrow ridge, about half a mile long N.W. and S.E., and covered with pine trees. It is separated from *Ba-ad-dah Point* by a 4-fathoms channel, $2\frac{1}{2}$ cables wide. Off the S.W. part a rocky ledge and shoal water extends for 3 cables.

The bay offers a safe and convenient anchorage to vessels meeting S.W. or S.E. gales at the entrance to the strait. A good berth will be found in 6 fathoms, sandy bottom, with the outer point of *Wyadda Island* N.E. by N., and *Koikla Point* W. by N. A short distance within this position kelp grows in large patches all over the bay, and some care is necessary in selecting a berth. Large sailing vessels may anchor in 7 or 8 fathoms a little outside the above bearings, in the centre of the bay, with the outer point of the island N.E. by E. The holding ground is not so good on the island side. It is high water in the bay at $12^h 33^m$; springs rise $7\frac{1}{4}$ ft., neaps $4\frac{3}{4}$ feet.*

The best anchorage is in about 5 fathoms, in the South part of the bay, off the small stream running in at the eastern foot of the hills, where some Indian houses will generally be found, and abundance of fresh water. A *lifeboat* is stationed at *Neeah Bay*.

A vessel should leave this bay on any indication of a N.E. wind, and if too late, and unable to weather *Wyadda Island*, she may, with the assistance of the chart, run between it and the main.

The rugged coast to the eastward of *Neeah Bay* is quite unfit for settlement; although behind the rocks which line the shore lies much rich and fertile land, which, however, can only be reached from *Admiralty Inlet* and *Puget Sound*.

CALLAM BAY.—From *Neeah* to *Sekou Point*, on the western side of *Callam Bay*, the distance is 14 miles. The intervening coast, which trends in an E. $\frac{1}{2}$ S. direction, is nearly straight, and the shore bold, the only remarkable feature being *Klaholoh (Seal Rock)*, 150 ft. high, which lies a short distance off the shore, 2 miles eastward of *Wyadda Island*. The bay is easily recognized by *Slip Point*, its eastern bluff, which is the western termination of a bold coast ridge, about 1,000 ft. in elevation; some rocks are said to lie off it.†

Callam Bay is 2 miles wide, with about 6 fathoms water in its centre, and a small stream runs into its head. It is open to the northward; the usual

* Commander R. O. Mayne, R.N., who was engaged on the survey under Capt. G. H. Richards, says in his interesting book that the Indians muster here in large numbers, owing to the quantity of cod, halibut, and other fish, on the bank running out from the shore of the island. The fishery will, no doubt, at some future time, prove a source of considerable profit to the colony.

† About halfway along the face of this ridge is a vein of lignite, a coal not fit for steamship use, but it contained 68 per cent. of carbon. The face of this ridge has deep water, but the bottom is very irregular.

anchorage is in 6 to 8 fathoms, but it must be considered as only a temporary stopping-place, being only safe with southerly winds.

The coast from Callam Bay continues in the same direction for 7 miles to *Pillar Point*, so called from its terminating in a bare columnar-shaped rock, a little remarkable, where, from the character of the country, generally thickly wooded from summit to water-line, few objects present themselves by which vessels may accurately fix their positions. The coast on the East side of this point forms a small bight, in which there is a considerable stream and an Indian village, and then trends E. by N., with a gentle curve to the southward, to Striped Peak, distant 17 miles; a small river, the *Lyre*, emptying itself just eastward of Low Point, 7 miles westward of the peak. Rocks abound close along the shore.

Striped Peak is rather remarkable from a landslip occurring down its face, and from which it received its name. It is several hundred feet high, but the landslip is rapidly becoming obliterated by vegetation. At $1\frac{1}{2}$ mile westward of the peak, and a third of a mile off the West point of *Crescent Bay*, which is merely an indentation, lies a rock, which breaks at low water, the only known detached sunken danger which occurs on the southern side of the strait, with the exception of one off the shore, $6\frac{1}{2}$ miles westward of New Dungeness. Westward of it some kelp grows a short distance from the beach, on the somewhat sheltered part between Striped Peak and Pillar Point, and here the depth of water at a mile from the shore varies from 8 to 16 fathoms; westward of Pillar Point it deepens to 40 fathoms at that distance.

FRESHWATER BAY, at 3 miles eastward of Striped Peak, is a mile deep between Observatory and Angelos Points, the two entrance points, which lie 3 miles apart E. by N. $\frac{3}{4}$ N. and W. by S. $\frac{3}{4}$ S., and within this line the depth varies from 6 to 12 fathoms. *Observatory Point* has several rocks lying a short distance off it; the western side of the bay is a high bold shore. *Angelos Point*, the eastern entrance point, is low, and here the river *Elwha*, emptying itself through it, forms a delta. Vessels may anchor within the line of the points in from 6 to 9 fathoms, but being open to the northward, it should only be used as a temporary stopping-place.

Eastward of Angelos Point the hills recede, leaving a level space between them and the coast. Thence they rise to a great height, their summits capped with snow, even in summer, forming some of the highest peaks of the Olympus range.

PORT ANGELOS, or False Dungeness, is 7 miles eastward of the East point of Freshwater Bay, the intervening coast forming rather a deep indentation to the southward, off which as little as 3 fathoms water is found nearly a mile from the shore. The North side of the port is bounded by one of those low narrow sand or shingle spits which are a characteristic feature of the country. This spit, which is named *Ediz Hook*, or *False Dungeness*, curves from a high bluff in an E.N.E. direction for nearly 3 miles, and forms a large and good

harbour. On the North or spit side the water is deep, varying from 15 to 30 fathoms; but southward of a line drawn through the centre there is excellent anchorage in from 7 to 10 fathoms in any part of the port. The outer part of the spit is steep-to, and may be rounded close-to, after which the port extends for $2\frac{1}{2}$ miles in a westerly direction, by more than a mile in breadth. Although open to easterly winds, they do not blow home. *Fresh water* is to be obtained from streams on the South side of the port. Coal is reported to have been found within 3 miles of the point.

Light.—About 27 yards from the eastern extremity of Ediz Hook is a square white lighthouse, 35 ft. high, with a red lantern, from which is shown a *fixed bright* light, elevated 42 ft., and visible 12 miles.

The spit is so low that at times the sea washes over it, and as it is impossible to see it at any distance, vessels would be apt at night, were it not for the light, to run on it if passing close to the southern shore of the strait. At night vessels should not go within the depth of 14 fathoms.

The white sandstone cliffs on each side of Port Angelos are mostly bare of trees, whilst those within the port are nearly covered with trees. From the lighthouse on Ediz Hook, New Dungeness lighthouse bears N.E. by E., distant $12\frac{1}{2}$ miles, the coast within this line forming a large bay, in which the soundings are regular, shoaling from 18 and 25 fathoms to 5 and 3 fathoms. Anchorage may be had in this bay with easterly winds, but it is exposed to the West and N.W.

At 5 miles E.N.E. from the entrance of Port Angelos is *Green Point*, the coast westward and eastward of it being composed of high, inaccessible cliffs, with a bench of shingle, sand, and boulders. At $1\frac{1}{2}$ mile N.E. by E. of Green Point, and half a mile from the beach, lies *Pandora Reef*, a sunken rock with 11 ft. over it at low water, well marked by kelp.

NEW DUNGENESS BAY.—From Green Point the coast extends $2\frac{1}{2}$ miles farther to E.N.E., and then runs north-easterly for 2 miles to the commencement of another long, low, narrow sand-spit, covered with grass, stretching from the bluff shore in a general N.E. by N. direction for $3\frac{1}{2}$ miles, forming the N.W. side of the roadstead of New Dungeness. The sea washes over it occasionally. A narrow shoal extends north-eastward for half a mile from the end of the spit, and having from 2 to $2\frac{1}{2}$ fathoms water over it; a heavy tide-rip runs over it at the change of the currents, and deep water is found close to its extremity.

The spit just described encloses a large space where shelter may be found from winds between North and S.E., round by the West, in 5 to 10 fathoms. The bottom being stiff mud affords good holding ground. This place is more convenient as a temporary anchorage than Port Discovery.

On the inside of the spit, 1 mile from the eastern extremity, another narrow sand-spit stretches $1\frac{1}{2}$ mile southward towards the main shore, forming a large *North Pacific*.

inner shoal bay with a narrow opening, through which the water passes as over a rapid, at low tide; abreast this point, is a small stream, on the western side of which is a bluff 60 ft. high, and upon it is a large village of the Clallums. The shore eastward of the stream is low, swampy, and covered with trees and brush; it forms the southern or main shore of the roadstead, and off it are extensive mud-flats, which are bare at low water for five-eighths of a mile, and run as far as Washington or Budds Harbour; shoal water exists for some distance outside these flats. A depth of about 20 fathoms is found a quarter of a mile southward of the lighthouse point, the depth regularly decreasing across the bay with a soft tenacious muddy bottom.

Fresh water may be obtained in abundance at the above stream, but boats must obtain their supply at low tide, and come out when the tide has sufficiently risen. There is a village here, with a church.

LIGHT.—Near the outer end of the spit is a structure consisting of a keeper's dwelling, of stone, with a tower of brick; the upper half being a dark lead colour, the lower half white. The tower is 89 ft. high, and exhibits a *fixed bright light*, elevated 100 ft. and visible 16 miles. Lat. $48^{\circ} 10' 59''$ N., long. $123^{\circ} 6' 7''$ W.

In foggy weather a steam *Fog Whistle*, 130 yards north-eastward of the lighthouse, is sounded every minute, as follows: a blast of 6 seconds followed by an interval of 12 seconds, and then a blast of 3 seconds followed by an interval of 39 seconds.

The usual and best anchorage in New Dungeness Bay, is to bring the lighthouse to bear about N. by E. $\frac{1}{2}$ E. half a mile distant, where 10 fathoms is found a third of a mile off the beach. With the lighthouse bearing N.W. by N. three-quarters of a mile distant, the same depth and bottom are found, the nearest shore will bear South $1\frac{1}{2}$ mile, and the mud flat three-quarters of a mile in the same direction; from this position a vessel can readily get under weigh and clear the point.

It is high water at New Dungeness, on full and change, at 3^h, and the rise is 5 feet.

The coast from New Dungeness trends to the E.S.E. for nearly 7 miles, and forms a deep indentation, in the western corner of which is *Washington* (or Budd's) *Harbour*, and in the eastern Port Discovery. The entrance of the former is almost closed by a long sand-spit extending from the eastern side, leaving a narrow channel with only 2 fathoms water, which deepens within to 13 and 20 fathoms. The coast from New Dungeness is low, flat, covered with trees, and bordered by an extensive mud flat. The Indian name of the bay is S'quim.

PORT DISCOVERY, the harbour where Vancouver anchored and refitted his ships, and from whence he commenced his exploration of these regions in May, 1792, is an extensive inlet running in a southerly and S.E. direction for 6 miles, with an average breadth of $1\frac{1}{2}$ mile; the general depth of water is

from 20 to 30 fathoms, but an anchorage may be had on the West side, $1\frac{1}{2}$ mile within the entrance, in 15 fathoms, close to the shore. A spit extends a short distance off *Clallum Point*, the western point of entrance, and there is also shoal water off *Cape George*, on the opposite side. At the head of the port there is 10 fathoms, but a mud flat extends for a quarter of a mile from the shore. *Salmon River* runs into its head. The shores are abrupt, and covered with wood. *Mount Chatham*, 2,110 ft. high, rises near the S.W. part of the bay.

Protection Island lies 2 miles immediately off the entrance of the port, and shelters it from N.W. winds. Its western extremity lies $7\frac{1}{2}$ miles E. $\frac{3}{4}$ S. from New Dungeness lighthouse, and it extends thence $1\frac{3}{4}$ mile to N.E. $\frac{1}{2}$ E. Its seaward part is covered with timber, but the southern side is undulating, and covered with fern. Off the northern side a line of kelp, about half a mile out, marks the 4-fathoms line, and from this *Dallas Bank* runs 3 miles to the N.N.W., with 5 to 15 fathoms on it, with a patch of 3 fathoms 2 miles N.W. of the North point of the island. There is good anchorage on the bank with light airs and strong adverse currents. Reefs extend about half a mile off the East and West points of the island, but there is a clear deep channel in on either side.

Vancouver stated that there are few places where the variety and beauty of the flowers are so great as they are here, surrounded by woods, almost impenetrable in some places. He also mentions having here seen some tall poles erected on the shores, which Commander Wilkes, in 1841, ascertained to be used by the Indians for suspending nets for taking the wild fowl, which frequent the shores in great numbers. There is a village and saw-mill here.

ADMIRALTY INLET.—At 14 miles E.N.E. from New Dungeness light is the entrance to Admiralty Inlet, $4\frac{1}{2}$ miles wide, between Wilson Point on the West and Partridge Point to N.W. by N. $\frac{1}{2}$ N., the latter a remarkable sloping cliff of a whitish or yellowish colour; and here commences that extensive and singular series of inland navigation, which penetrates the continent in a general southerly direction for nearly 90 miles.

Between Port Discovery and Wilson Point, about 6 miles to the eastward, the shore is high, with steep yellow cliffs; during ebb tides a very strong eddy current sets to the eastward along this shore. *Wilson Point*, the N.E. extremity of Quimper Peninsula, is composed of low sandy hillocks, with a shoal spit extending nearly half a mile off it.

The **LIGHTHOUSE** on Wilson Point is 46 ft. high, and painted white, showing a *fixed bright* light, elevated 33 ft., and visible 12 miles. In foggy weather a *Fog Whistle* sounds a blast of 8 seconds in every minute.

PORT TOWNSHEND lies at the threshold of Admiralty Inlet, and is the port of entry for the Puget Sound district of Washington Territory. Vessels leaving Fuca Strait have frequently, when overtaken by a westerly gale, been

compelled to bear up and seek shelter in it. Although a safe harbour, from its great extent it is subject to a disagreeable sea during strong winds.

The entrance is between Wilson and Marrowstone Points, the latter bearing from the former E.S.E., $3\frac{1}{2}$ miles. At $1\frac{1}{2}$ mile S.E. by S. $\frac{1}{2}$ S. from Wilson Point, and on the same side, is *Hudson Point*, the distance between which and Marrowstone Point is also $1\frac{1}{2}$ mile; and between these two points is more properly the true entrance of the port, which now runs in a S.S.W. direction for 3 miles, and then S.E. for about the same distance, the average breadth being nearly 2 miles; the general depth of water is from 9 to 15 fathoms, good holding ground, soft mud when within Hudson Point. Hudson Point should be rounded within half a mile or less.

At half a mile within Hudson Point there is good anchorage in the western side of the port, off the wharf and houses, in 8 to 10 fathoms, from a quarter to half a mile from the shore. In winter anchor farther out, to clear Hudson Point in getting under way with a south-easter. It is high water, on full and change, at 3^h 49^m; springs rise $5\frac{1}{2}$ ft., neaps 4 ft.

The town of Port Townshend has increased very much since the discovery of gold on Fraser River, and the rise of the settlements on Puget Sound, whence large quantities of timber, coal, &c., are now exported, which is expected to greatly increase in the future from the construction of railways, and the consequent opening up of the country. In 1883 the population numbered 1,600. There is a Marine Hospital here. Fresh water is scarce, but vessels can obtain a small supply near the military post. Some fine farms lie near the town, and vegetables are plentiful at reasonable prices. There is a blast furnace in operation here, making iron from native ore.

The military post is on the bluff, $2\frac{1}{2}$ miles S. by W. from the town, and on a site which commands one of the most beautiful views in these waters, having the bluff and varied shores of the bay on either hand.

In 1882, the value of the exports to foreign countries from Puget Sound amounted to about £304,318, chiefly in lumber, and in American vessels. Besides this there is a large export trade to San Francisco, and other ports of the United States. In the same year 408 vessels entered from foreign ports, with a total tonnage of 240,866.

Opposite the town is the entrance to *Kilisnoet Harbour*, nearly closed by a long sand-spit. At high tide boats can pass from its South end to Oak Bay. There is only a narrow portage between the latter and the head of Port Townshend.

Marrowstone Point is a low sandy point stretching 300 yards eastward from the base of the bluff, and forming an indentation on its southern face, where anchorage may be had in 12 fathoms, with a current or eddy invariably running ebb.

ADMIRALTY HEAD, abreast of the entrance to Port Townshend, and $3\frac{1}{2}$ miles N.E. by E. from Wilson Point, is a perpendicular cliff 80 ft. high, desti-

tute of trees, falling on the eastern side to a low, pebbly shore, which runs 2 miles to the E.N.E., and strikes the high cliffs on the eastern side of the inlet. This bay has a hard, sandy bottom; a strong current always makes out of it, and it is exposed to the full sweep of south-easters.

The **LIGHTHOUSE** on Admiralty Head consists of a keeper's dwelling, with a square white tower, 41 ft. high, showing a *fixed bright* light, elevated 108 ft., and visible about 17 miles. Its geographical position is lat. $48^{\circ} 9' 22''$ N., long. $122^{\circ} 41'$ W.

ADMIRALTY INLET is a collection of very singular and labyrinthine channels, terminating at Puget Sound and its various branches, which reach the lat. of $47^{\circ} 2'$. Some portions of their shores are remarkably fertile and beautiful, and it would seem to be almost the only eligible part for colonization in Washington Territory. The original settlements emanated from the Hudson's Bay Company. The term Puget Sound is sometimes applied to the whole of the waters extending from the Strait of Juan de Fuca to the southern extremity of Puget Sound.

The whole of these inlets were accurately and amply explored and surveyed, for the first time by Vancouver, in May, 1792, and most of the names were applied by him. Hood's Canal was thus named after Lord Hood. The American Exploring Expedition, under Capt. Wilkes, also surveyed the assemblage of inland waters, adding the names not given by Vancouver, chiefly those of the officers of the expedition.

The shores of all these inlets and bays are remarkably bold; so much so, that in many places a ship's side would strike the shore before the keel would touch the ground. The following is a general description of the principal remarkable objects.

Starting from abreast Marrowstone Point the mid-channel course up Admiralty Inlet runs S.E. by S. $\frac{1}{4}$ S. for 7 miles. The shores on either hand are bluffs of apparently uniform height, covered with trees. After running thus about 5 miles there will be passed, on the eastern shore, a low point, with one or two clumps of trees and bushes, named *Bush Point*. On the western shore is *Nodule Point*, a rounding bluff point, 1 mile North of the N.E. point of Oak Bay; off this point there is good anchorage in 12 or 15 fathoms. The high, bold headland, several miles directly ahead, is *Foulweather Bluff*, and that to the E.S.E., destitute of trees, except one large clump, which marks it conspicuously from this direction, is *Double Bluff*. The deep indentation between it and Bush Point, with low land in the rear, is *Mutiny Bay*. At the end of the course *Oak Bay* opens to the westward, and stretches towards the waters of Port Townsend. It has bluff shores nearly all around it, with a depth of 5 to 15 fathoms. The length of the bay is 3 miles, and its average width about $1\frac{1}{4}$ mile.

The opening West of Foulweather Bluff is *Hood Canal* (hereafter described);

vessels bound into it keep close to the western shore of the bluff, and pass two low points lying near together.

The next or third course up the inlet is E.S.E. for 10 miles, passing on the eastward *Double Bluff*, which stretches north-eastward for a mile, and rises 300 or 400 ft., having its top covered with wood. The bluff running also to the northward forms *Useless Bay*, which has deep water over the greater portion of it, with a large shallow bay called *Deer Lagoon* at its head. The high bluff forming the southern point of Useless Bay is *Satchel Head*, and a similar bluff lies 2 miles E. by S. of it, with shoal water extending about half a mile off the coast. These form the southern extremity of Whidbey Island, in lat. $47^{\circ} 54'$, and are the turning points into *Possession Sound*. The two heads are about 300 ft. high, and covered with trees.

Foulweather Bluff.—On the western side of the last mid-channel course is Foulweather Bluff (already noticed), which is perpendicular on its N.N.W. face, and about 225 ft. high, with heavy firs upon its summit. It slopes towards the East to a bluff 40 ft. high, but is steep on the side next to Hood Canal. The low point, 4 miles eastward of it, is *Point No Point*, making well out, and destitute of trees or bushes; there is good anchorage in 10 fathoms on the South side of this point, and thence the western shore runs nearly straight S.E. by S. for 10 miles.

Light.—On Point No Point is a white lighthouse, 20 feet high, showing a fixed bright light, elevated 27 ft., and visible 10 miles. In foggy weather a Bell, in a tower on the outer end of the spit, is struck once every 10 seconds.

At the end of the last course the inlet expands to a width of 7 miles. The next, or fourth mid-channel course up the inlet, is S.S.E. for 21 miles to *Allen Bank*, which lies a mile off the North end of Vashon Island. Five miles on this course, or 7 miles from Point No Point, brings us to an excellent little harbour on the western side of the inlet, called *Apple-tree Cove*, having a low point on the North side, with a soft mud-flat extending several hundred yards up the inlet. There is no fresh water in the vicinity, but very good timber may be procured suitable for boat-spars and booms.

On the eastern shore, opposite the cove, is a small indentation with good anchorage, and where fresh water might be procured at high tide. The inlet is here only 3 miles wide, and continues so to Point Jefferson, 2 miles southward of Apple-tree Cove. This is a moderately low, straight bluff, with the ground rising behind it, and covered with timber. Stretching off its eastern face for three-quarters of a mile is a 9-fathoms shoal, which affords capital anchorage for vessels when drifting with light airs and adverse currents.

At night, vessels entering Admiralty Inlet from the strait should steer for Admiralty Head light bearing E. by N., keeping Wilson Point light open on the starboard bow. When the latter light bears S.W. by S. $\frac{1}{2}$ S., a S.E. $\frac{1}{2}$ E. course will lead direct to Point No Point. When Double Bluff bears N. by

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E. $\frac{1}{2}$ E., change course to E. by S., until Point No Point bears South, when alter course to S.E. $\frac{1}{4}$ S. for the southern part of the inlet.

PORTS MADISON and Orchard.—*Point Jefferson* is the northern side of the entrance to Port Madison, which runs 3 miles W.S.W., with an average width of 2 miles, and a great depth of water, except under Point Jefferson, where anchorage may be had in 10 and 15 fathoms, hard sandy bottom, with patches of kelp inshore.

The S.E. point of the entrance is low and sandy, making out from high wooded ground. At a mile West of it is the narrow entrance to a natural canal, upon which, in full view, are situated the Port Madison saw-mills. At the S.W. part of the bay is the very narrow entrance to Port Orchard, where there is a saw-mill. The channel is somewhat crooked, but it has 3 and 4 fathoms water in it. On the western side of this entrance are some white patches of beach, formed by clam shells. Both sides of the entrance are bluffs. Vessels not well acquainted with the channel must enter under easy sail, and keep a lead going on each side of the vessel to ascertain where the deepest water lies. After getting through, give the point, 1 mile off on the western side, a berth of nearly half a mile, to avoid a shoal which makes out East from it.

Bainbridge Island lies between Port Orchard, Port Madison, and Admiralty Inlet. It is 8 miles long by $2\frac{1}{2}$ miles in breadth, and its general direction is S.E. by S. A few loggers' huts stand on the western side, and the Madison saw-mill at the North end. On the S.E. part it is indented by two small harbours.

Duwamish Bay.—Abreast of Port Madison the eastern shore of the inlet retreats, and there receives several small streams, but it gradually makes out into a very long, low, sandy point, called *West Point*, which forms the extreme N.W. part of the entrance to Duwamish Bay. The bay runs E. by S., $6\frac{1}{4}$ miles, and has a width of 2 miles. To the South point, *Roberts* or *Battery Point*, which is low and bare, with a curiously-shaped mound rising sharply behind it, the course is about S.E. by S., and distant $4\frac{1}{2}$ miles. There is anchorage in 10 to 15 fathoms under West Point, but on the North side the water is very deep. Through the centre of the bay the depth ranges from 88 to 40 fathoms. On the North side of Battery Point a vessel anchoring in 20 fathoms cannot have a greater scope of chain than 35 fathoms without being too close to the shore. On this side of Battery Point is the deserted town of Alki (the Indian phrase for "by-and-by"). The town has had several names, but there is nothing about it to command trade.

Duwamish Head is a bluff head, 2 miles N.N.E. of Battery Point, about 150 feet high, and covered with trees; at low water the beach extends over a quarter of a mile N.N.W. of it. The head of the bay is an extensive flat, bare at low water, into which flows the Duwamish River.

The Lighthouse on the extremity of West Point is a square brick tower,

painted white, with a red lantern, showing a *flashing* light, alternately *red* and *bright*, every 10 seconds, elevated 20 ft. above high water, and visible 10 miles. Behind the lighthouse is a white structure, containing a *Bell*, which in foggy weather is struck by machinery at alternate intervals of 5 and 25 seconds.

Vessels approaching from the northward, after passing about 1 mile off Point No Point, should steer S.E. $\frac{1}{4}$ S., and when West Point light bears S. by E. $\frac{1}{4}$ E., alter course to S. by E. After passing the light, at one-third of a mile distant, bring it to bear N. by E., when an E. $\frac{1}{4}$ S. course leads into Seattle Harbour.

SEATTLE.—The town of Seattle is situated at the N.E. part of Duwamish or Elliot Bay, a little over 5 miles inside of West Point. It is the largest town on Puget Sound, and had a population of 9,000 in 1883, having nearly doubled the number of its inhabitants in two years. Large quantities of lumber and coal are exported, also salmon, wool, flour, and iron. The largest vessels can lie alongside the wharves.

There is a railway from here joining the main line to Portland at New Tacoma, 25 miles distant, and another line extends 21 miles eastward to the coal mines of Newcastle, which yielded about 220,000 tons of coal (pure lignite), in 1882, which is conveyed by steamers to San Francisco, 154,611 tons having been shipped in that year, and 167,600 tons in 1883.

Seattle has been proposed as the terminus of a branch of the Northern trans-continental Pacific Railroad, penetrating the Cascade Mountains by the Yakima Pass, and thereby making the line 140 miles shorter than by the Columbia River pass.

The usual anchorage is directly off the wharf, in 10 to 15 fathoms, with the large white house on the extreme point bearing about East, or E. by S., and at a distance from the beach of about 500 yards.

RESTORATION POINT.—From the S.E. point of Port Madison to this point the shore of Bainbridge Island is bluff and somewhat irregular, and is indented first by Eagle Harbour, having a long pebbly spit, making out 300 or 400 yards S.E. from its North point; and next, at Point Restoration, by *Blakely Harbour*, having off its entrance a large rock, 15 ft. high, with deep water all round it, lying three-quarters of a mile nearly N.N.W. from the point. *Blakely Harbour* is only a quarter of a mile wide, and three-quarters of a mile long, with 18 fathoms, sticky bottom, at its mouth; there is a saw-mill here. *Eagle Harbour* is larger and more commodious than *Blakely*.

Restoration Point is low and flat for about 300 yards on its S.E. face, rising sharply inshore to about 100 ft., its sides covered with grass, and the summit with firs. A ledge, bare at low tides, extends $1\frac{1}{4}$ cable off its extremity. There is anchorage at a quarter of a mile S.S.E. of the point, in 15 fathoms, sticky bottom; anchorage can be found by bringing the rock North of it to range just over and inside of the point.

The geographical position of the triangulation station of the Coast Survey upon this point is lat. $47^{\circ} 35' 6''$ N., long. $122^{\circ} 29' W.$, approximate. From this point Battery Point bears E. by N. $\frac{1}{2}$ N., distant $2\frac{1}{2}$ miles.

The approximate establishment at Restoration Point is $4^h 4^m$; the mean rise and fall of tides is 7.4 feet.

South of Restoration Point, Admiralty Inlet opens westward for a couple of miles into a bay, in which is situated an island about three-quarters of a mile in extent, called *Blake Island*. From the N.W. part of the bay a narrow crooked pass, 3 miles long, leads to the southern part of Port Orchard, which spreads out into several arms. The pass is obstructed by rocks, and is difficult of navigation. There is anchorage in 17 and 18 fathoms, mud, under the low eastern point of Blake Island.

Our last course brought us to *Allen Bank*, off the North end of Vashon Island, with Blake Island to the westward, and three-quarters of a mile distant. This bank is nearly a mile in extent, and has as little as 10 fathoms upon it, with a variable bottom, in some places mud, and in others hard sand. The N.E. point of Vashon Island is Dolphin Point; the N.W. point, Point Vashon; the point abreast of it is Point Southworth; and the channel 1 mile wide, commencing between the last two points, is *Colvos Passage*, running West of Vashon Island.

The main body of Admiralty Inlet continues about S.E. for 8 miles, then S.S.W. 8 miles further, with an average width of 2 miles. In this stretch the currents are moderately strong, the chances for anchoring few, and it is sometimes calm while a fine breeze is blowing through Colvos Passage.

Brace Point lies on the East side of the inlet, N.E. from Dolphin Point. In *Fauntleroy Cove*, northward of Brace Point, there is good anchorage in 10 and 12 fathoms, and here fresh water is easily obtained. The round-topped point having two or three lone fir trees upon it, and situated on the same side of the inlet, 4 miles above Brace Point, is called *Point Pully*; the water is very deep close to it on either side.

Colvos Passage is the usual, we may say the invariably used ship-channel towards Puget Sound. It is about a mile wide, with high bluff shores, varied by numerous small, low sandy points making out from the face of the bluff, and having deep water off them. The passage is 11 miles long to the South end of Vashon Island, called *Dalco Point*, and it runs with a nearly straight course S. by E. At $1\frac{1}{2}$ mile inside of Point Vashon there is a small curve in the shore-line called *Fern Cove*, with excellent anchorage in 5 and 10 fathoms. Abreast of Dalco Point on the western shore there is a small harbour, with a narrow and shoal entrance, called *Gig Harbour*. Looking out of the passage to the North, Mount Baker shows distinctly in clear weather.

COMMENCEMENT BAY.—When abreast of Dalco Point this bay, at the termination of Admiralty Inlet, opens to the E.S.E., and over its low back-
North Pacific.

ground shows the high snow-covered peak of Mount Rainier. The general direction of the bay is E. by S. $\frac{1}{2}$ S., with a length of 3 or 4 miles, a width of 2 miles, and a great depth of water up to the line of the extensive flat at its head, which is backed by marsh.

PORT TACOMA, at the head of Commencement Bay, is now rising into prominence as a shipping port for wheat, coal, &c. At its back lies an immense forest, and in the vicinity are extensive deposits of good coal. Hops are grown in the neighbourhood. The railway from Columbia River and Portland, 147 miles distant, terminates here, and branch lines extend to the eastward to the Carbonado coal mines, 33 miles from New Tacoma, and northward to Seattle. In 1883 the town had about 4,000 inhabitants, exclusive of the adjacent old town of Tacoma, and was expected to increase very rapidly in size and importance. Several cargoes of wheat have already been despatched from Portland by railway, for shipment at Tacoma. In 1883, 130,400 tons of coal were shipped from here to San Francisco.

Vashon Island, lying between the southern extremity of Admiralty Inlet and Colvos Passage, is $11\frac{1}{2}$ miles long, with an average width of $2\frac{1}{2}$ miles. The island is high, with steep shores, covered with wood and undergrowth. Its surface is marshy in many parts that are quite elevated. Halfway down on its eastern side lies a curiously shaped peninsula, formed by a narrow, low sandy neck of land, which makes out into the inlet, and then runs towards the South point of the island. The space between this peninsula and the island is an excellent harbour, known as *Quartermaster Harbour*, 4 miles long, and three-quarters of a mile wide, having a depth of 5 to 10 fathoms water in it.

Point Defiance and the Narrows.—The high, sharp yellow bluff facing the South entrance to Colvos Passage is called *Point Defiance*, and between it and the western shore pass all the waters of Puget Sound. This passage is named the *Narrows*. Its average width is three-quarters of a mile, and very uniform; the shores are high, bold, and in some places rocky. For 2 miles to the S.E. its course is a regular curve. The next turn is to the southward, and at a distance of 2 miles in that direction the waters of the sound open ahead, with a narrow pass between the main and Fox Island to the West, and on the East is a small peninsula, with anchorage in 15 fathoms on its North side; there is only anchorage on its South side outside the kelp.

PUGET SOUND is a most singular termination to Admiralty Inlet. The fertility of its shores, and its fine climate, may possibly make it of considerable importance in future years. It received the name of Mr. Puget, the officer under Vancouver's expedition, who originally surveyed it.

Puget Sound may be described as a collection of inlets, contained in an area of 20 miles square, the only entrance to which is through the Narrows, which, if strongly fortified, would bid defiance to any attack, and guard its entrance against any force. The aggregate shore-line of this sound, and the adjacent

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part of Admiralty Inlet, with Colvos Passage, to the North end of Vashon Island, is not less than 370 miles. Upon its shores are situated the settlements of Steilacoom, Nisqually, Olympia, and Newmarket.

The inlets, in the order in which they come from the entrance, have received the names of *Carr*, *Case*, *Hammersley*, *Totten*, *Eld*, *Budd*, and *Henderson*, from the officers of the United States' Exploring Expedition; they are united by passages, which form several islands and peninsulas. All these inlets are safe, commodious, and capacious harbours, well supplied with water, and the land around them fertile. On many of the islands and peninsulas are to be found slate and sandstone, which, though soft and friable in some places where it has been exposed on the surface, will be found suitable for building purposes.

Steilacoom.—On the eastern shore of Puget Sound, 9 miles South of Point Defiance, is situated the town or village of Steilacoom, upon a rising bluff, with about 600 inhabitants. Fort Steilacoom stands about a mile inland, upon a piece of gravelly prairie, and roads lead from it to the town and the creek.

The usual anchorage is off the small wharf, in 15 fathoms, hard bottom, and about 2 or 2½ cables from the shore. An island lying 2¼ miles westward of that position is called McNeil (Duntze), and between it and Fox (Rosario) Island, to the northward, there is a passage 1½ mile wide. The passage on the South side of McNeil Island, between it and Anderson (Figard) Island, is generally known as Balch Passage. It bears about S.W. by W. from the anchorage, and is marked by a small wooded islet in it, called Eagle Island, off which lies rocky bottom, and vessels keep closer to the North shore. This passage is the direct channel to Olympia, instead of following the broad one southward of Steilacoom.

When approaching Steilacoom, or bound direct for Olympia, a patch of kelp, with foul bottom and less than 3 fathoms of water upon it, must be avoided. It bears S.S.E. 1 mile from the South end of Fox Island, and N.W. by W. 1½ mile from Steilacoom wharf. The tide-rip upon it and abreast of the town is very great; quite sufficient, with a little wind, to swamp a small boat. The shores of the main and islands are bold, nearly uniform in height, and covered with trees.

The corrected establishment of this port is 4^h 46^m; spring tides rise 11.1 ft., and neap tides 7.2 feet.

Nisqually, 5 miles South of Steilacoom, and on the same side of the sound, is at present a place of little or no trade or importance. It was one of the early posts of the Hudson Bay Company. An extensive mud-flat exists off the mouth of the wide, marshy valley, but the depth of water is very great close to it, and the anchorage room very much contracted. The River Nisqually empties here, and there are two small saw-mills upon it.

OLYMPIA.—It would be almost useless to attempt to describe the route to

Olympia from Steilacoom, as a pilot or a good chart is absolutely necessary in making the passage. The mid-channel course is 21 miles in length, and its width from half to $1\frac{1}{2}$ mile.

Olympia is situated at the head of Budd Inlet, which is 6 miles long and three-quarters of a mile wide, and runs nearly South. The shores are steep and wooded, and the head of the bay an immense mud-flat, behind which is the town. It had a population of 2,100 in 1883, and acquires importance from being the capital of the territory, but especially on account of its proximity to the Columbia River valley, and to the headwaters of the Chehalis. As before stated, a railway runs from here to Kalama on the Columbia River, a distance of about 65 miles, from whence there is also communication with Portland. The lumber trade is its principal industry.

A depth of 3 fathoms can be carried on the West side of Budd Inlet, within $1\frac{1}{2}$ mile of the wharf. Vessels are brought up to the wharf at the highest tides, and then rest in the mud until ready to leave. The approximate geographical position of the wharf is lat. $47^{\circ} 3'$, long. $122^{\circ} 55'$.

The greatest difference between the highest and lowest tides is reported to be about 24 ft., and is doubtless more than this when we compare its position with that of Steilacoom. The approximate corrected establishment is $5^h 8^m$.

At 2 miles South of Olympia is *Newmarket*, on the Tumwater River, where there are saw and flour mills, with several other saw-mills in its vicinity.

HOOD CANAL.—The entrance to this arm of Admiralty Inlet lies between Basalt Point and Foulweather Bluff, the latter bearing E. $\frac{1}{2}$ S., distant $3\frac{1}{2}$ miles from the former. The first mid-channel course is S.E. for 4 miles, pointing directly into Port Gamble, at the entrance to which the houses and mill are plainly visible; and passing a high, round, wooded peninsula on the West side of the channel, and connected to the main by a narrow neck of low sand beach. This is frequently mistaken for an island, and is called Hood Head. Between this head and Port Gamble the canal changes its course, and runs in nearly a straight line S. by W. 40 miles, with an average width of $1\frac{1}{2}$ mile. In lat. $47^{\circ} 21' N.$, it makes an abrupt turn, and runs for 12 or 13 miles about N.E.

Port Ludlow.—Close to Basalt Point lie some rocks, with others about half a mile S.E., called the *Colvos Rocks*, among which is one 25 ft. high, but of small extent. Close inshore, and abreast of this, is a rock just *awash* at high tide, but between the two runs a channel with 15 fathoms water, having soft muddy bottom. The bright bluff head, $1\frac{1}{2}$ mile S.E. of Colvos Rocks, and about 2 miles S.W. by W. from Foulweather Bluff, is *Tala Point*. Halfway between Colvos Rocks and this point is the usual entrance, over a sand-bar having $4\frac{1}{2}$ fathoms. Vessels can pass inside of Colvos Rocks, carrying deep water and 8 fathoms, soft muddy bottom, anywhere inside of Tala Point, even past the saw-mill if necessary; the mill lies $2\frac{1}{2}$ miles S.S.E. of Basalt Point,

on a low sand point, inside of which there is excellent anchorage in 7 and 8 fathoms.

Of all the small harbours in these waters this has the preference, as it is completely landlocked, and protected from gales from every quarter by the high land and high trees around it. The approach was marked by buoys. The first steamboat built in these waters was launched here in 1860.

Tekalet or Port Gamble.—After passing Foulweather Bluff, keep closer to the eastern shore than to the western, to avoid the strong current passing round the low point which makes out from Hood Head. Run for the saw-mill, plainly in sight, on the western side of the entrance to the bay, and when within a mile of it approach the eastern bluff within one-third of a mile, in about 10 or 15 fathoms, gradually drawing closer inshore, and passing between the outer white and inner black can buoys. At the lowest tides the white one is in 15 ft., the black in 12½ ft., and the small spar buoy between them in mid-channel in 17 ft., but it rarely shows above water at any tide. After passing these buoys the mill bears almost S.S.E. half a mile distant. Steer S.E. or halfway between the mill-wharf and the East point, pass to the East of the white spar buoy, which is in 12½ ft., and run through the entrance, passing the wharf at about one-third of the distance between the points. Do not round up to the eastward, as a shoal makes out almost parallel with the point. It may be here noticed that these buoys were made and placed by the Puget Mill Company, for the benefit of vessels trading to the port.

If the wind be ahead while beating up, it will be impossible for a large vessel to get in, as the channel is half a mile long, and not over 100 yards wide at the narrowest part. Anchor off the buoys, and drop in with the early flood, or warp in with the last of the ebb. On the shoal forming the western side of the passage 10 ft. water may be found until up with the white spar buoy. The bay extends 2½ miles to the S.E., and has a depth of 4 to 9 fathoms, mud bottom.

At about 3 miles from Hood Head, on the western side of the canal, is *Suquamish Harbour*. A large sand-bank occupies its centre, and extends a mile in length N.N.W., by half a mile in width. The approaches to the shoal, which is in part bare, are detected in thick weather by the lead, the soundings decreasing regularly from 20 fathoms. Keep, however, close under the northern shore, which runs 2 miles W.S.W. from the low point called Termination Point.

At 14 miles from Hood Head the canal curves more to the southward, and then to the S.S.W. around Hazel Point, on the West side of which a large arm of the canal makes North for 10 miles, bifurcating near its head. On its western side the eastern spurs of the Olympus range reach its waters, and form the western shore-line of the canal to the great bend. The sharp peak named *Mount Constance* is said to attain an elevation of 7,777 feet.

At 2 miles South of Hazel Point, and on the eastern side of the canal, is a

fine harbour, formerly called *Hahainish Harbour*, but the name has been changed to Seabock by settlers, who have built a small saw-mill there. It is formed by Seabock Island on the West, and is about a mile long by half a mile wide, with good bottom in from 10 to 15 fathoms. Shipbuilding is carried on here.

Above this Hood Canal becomes contracted in width, with very deep water. From Seabock Harbour it runs 22 miles to Annas Bay, in a general S. by W. direction, and then suddenly turns to the north-eastward, terminating in Lynch Cove, 12 miles from Annas Bay, and about 2 miles from the northern extremity of Case Inlet, a branch of Puget Sound.

WHIDBEY ISLAND, forming the eastern shore of the northern part of Admiralty Inlet, is about 33 miles in length, and of very irregular figure, being in some places not more than a mile broad. It is well fitted for settlement and cultivation. The soil is good, the timber excellent, and there are several open plains, which have been prepared by nature for the plough. There are many villages of the Scatchat tribe on the island.

POSSESSION SOUND may be considered as the southern entrance to the channel separating Whidbey Island from the main land. Its eastern shore is compact, forming a deep bay, into which the *Sinahomis* or *Skywhamish River* falls. On the southern side of this bay is the village of *Mukilteo*, and on the North side that of *Tulalip*; the coasting steamers call here on their way to and from Bellingham Bay. At 7 miles within the entrance is a high round island, lying in the centre of the sound, and off the entrance to the river. It was observed by Vancouver that the tide or current constantly set outwards here.

At 2 miles N.W. from this round island is *Point Alan*, the South extremity of *Camano Island*, which lies between Whidbey island and the main. Point Alan is the end of a high, narrow strip of land, which separates Port Susan on the East from Port Gardner on the West of Camano Island. *Port Susan* extends about 11 miles north-westward, and has deep water, terminated by a line of kelp fronting a tract of swampy land, through which a rivulet extends and divides the North end of Camano Island from the main. The land farther back is more elevated, and covered with a growth of timber similar to that in other parts. It was in the upper part of this inlet that Vancouver's ship, the *Chatham*, ran aground, but was soon got off.

Eastward of Alan Point, on the main land, is a small bay, before which Vancouver anchored. There were two excellent streams flowing into it, but they were so nearly on a level with the sea, that it became necessary to procure the water at low tide, or at some distance up the brook, which latter was easily effected, as the boats were admitted to where the fresh water fell from the elevated land. They also took some fish with the seine.

Port Gardner (so named by Vancouver after Vice-Admiral Sir Alan Gardner) is the western arm of the continuation of Possession Sound, its

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western shore being formed by Whidbey Island. This shore was found by Vancouver to be well peopled by Indians, who were very friendly. The water is deep, with good shelter from all winds. On the western side a deep inlet, named *Holmes Harbour*, extends about 5 miles S.S.E. into Whidbey Island, and has some rocks off its eastern entrance point. At about 14 miles from Point Alan, and 8 miles N.W. by N. of Holmes Harbour, the branch which runs thus far about W.N.W. assumes the directions of S.W. by W. and N.E.

Penn Cove is the termination of the western branch, and is a very commodious and excellent harbour, with regular soundings from 10 to 20 fathoms, good holding ground, sheltered from all winds. Its western extreme, in lat. $48^{\circ} 14'$, 5 miles from its entrance, is only about a mile from Partridge Point, on the western shore of Whidbey Island. On each point of the harbour Vancouver found a deserted village, in one of which were several sepulchres, formed exactly like a sentry-box. At the head of the bay is the village of *Coveland*, and farther to the S.W. is *Coupeville*, on Puget Sound.

The main channel to the N.E. leads to a branch whose general direction is N.W. From the eastern shore of this branch a shallow flat of sand, on which are some rocky islets and rocks, runs out until within half a mile of the western shore, forming a narrow channel, navigable for about 9 miles. The depth in its entrance is about 20 fathoms, but gradually decreases to 4 fathoms in advancing northward, and the sand-bank, continuing with great regularity, makes it about half a mile wide to lat. $48^{\circ} 24'$, where it ceases to be navigable for vessels of any burden, in consequence of the rocks and overfalls, from 3 to 20 fathoms deep, and a very irregular and disagreeable tide. Beyond this the channel communicates with Rosario Strait by Deception Pass. Between Fidalgo Island, on the eastern side of the northern end of the channel, and the main, is a narrow boat channel leading to Bellingham Bay. There is a saw-mill at *Utsalady*, on the North end of Camano Island.

In the bay just to the westward of the West entrance point of Possession Sound, that is, the South point of Whidbey Island, there is a shoal lying a little distance from the shore; it shows itself above water, and is discoverable by the soundings gradually decreasing to 10, 7, and 5 fathoms, and cannot be considered as any material impediment to the navigation of the bay.

From the entrance of Possession Sound the West coast of Whidbey Island continues in an irregular N.W. by W. $\frac{1}{2}$ W. direction to *Partridge Point*, which forms the N.E. point of the entrance of Admiralty Inlet. Admiralty Head, with its *lighthouse*, have been described on pp. 332-3. Partridge Point is a high, white or yellow sandy cliff, crowned with trees, having one of the verdant lawns on either side of it. It rises to an elevation of about 260 ft., and its southern part is in lat. $48^{\circ} 12' 30''$ N., long. $122^{\circ} 47'$ W., approximate. From this point the coast trends $11\frac{1}{2}$ miles northward to Deception Passage.

"Passing at the distance of about a mile from this point, we very suddenly came on a small space of 10 fathoms water, but immediately again increased

our depth to 20 and 30 fathoms. After advancing a few miles along the eastern shore of the gulf, we found no effect from either the ebb or flood tide."—*Commodore Wilkes, U.S.N.*

Smith, Blunt, or Bonilla Island, lying $6\frac{1}{2}$ miles N.W. of Partridge Point, and 5 miles from the nearest land, is at the eastern end of Juan de Fuca Strait, Rosario Strait going northward of it, and Admiralty Inlet to the southward. It is only about half a mile in extent, and rises to a height of 55 ft. at its western extremity. It is generally low and sandy, forming at its West end a cliff of clay and gravel, above which are some dwarf trees. From it the remarkably lofty and snowy peak of *Mount Baker*, 10,719 feet high, bears N.E. $\frac{1}{2}$ N., and that of *Mount Rainier*, 14,444 ft. high, S.E. $\frac{1}{2}$ E., the latter being the highest peak in Washington Territory. Two other very lofty snowy mountains are also seen to the southward of these. They appear to be covered with perpetual snow, as low down as they can be seen, and seem as if they rise from an extensive plain of low country. There is no fresh water on the island.

The *Lighthouse* on its western summit, showing a revolving bright light every half minute, is alluded to hereafter, on p. 352.

A field of kelp, with 6 fathoms water, extends $1\frac{1}{2}$ mile westward of Smith Island, with hard and sandy bottom. There is good anchorage on the North and South sides, eastward of the kelp, in about 10 fathoms or less. The eastern part is formed by a very narrow low spit of land, over which the tide nearly flows. A low islet lies nearly a mile N.E. of the island, and is connected with it by a narrow ridge of boulders and rocks, bare at very low tides.

At 3 miles southward of Smith Island is an extensive field of kelp, lying off Partridge Point. Within the 10-fathoms line it is 3 miles long E.S.E. and W.N.W., and $1\frac{1}{2}$ mile wide. The general depth on it is 5 to 10 fathoms, sand, gravel, and boulders, but the shoalest spot is said to have only 14 ft. over it, rocky bottom; this spot lies about $3\frac{1}{2}$ miles from the nearest shore of Whidbey Island, and about the same distance S.E. of Smith Island lighthouse, and was marked by a buoy moored in 20 ft. off its southern side.

Deception Passage, which runs into Port Gardner, to the North of Whidbey Island, is a very narrow and intricate channel, which, for a considerable distance, is not 40 yards in width, and abounds with rocks above and beneath the surface of the water. These impediments, in addition to the great rapidity and irregularity of the tide, render the passage navigable only for boats or steam vessels of small burden, and well acquainted. *Deception Islet*, small and wooded, lies off the entrance, with a sunken reef on its South side. *Lawson Rock*, a dangerous sunken rock of 3 fathoms, lies about $1\frac{1}{2}$ mile S.W. by W. $\frac{1}{2}$ W. from this islet.

To the northward of this the Strait of Juan de Fuca is limited by a collection of islands which separates it from that explored by Vancouver, and named by him the Gulf of Georgia. The North side of Deception Passage is formed by

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Fidalgo Island, separated from the main land on the East by a tract of low land, intersected by a narrow stream. *Mount Erie* rises to a height of 1,250 feet near its centre.

The country here assumes a very different aspect from that seen to the southward. The shores are here composed of steep rugged rocks, whose surface varies exceedingly as to height, and exhibits little more than the barren rock, which in some places produces some herbage of a dull colour, with some few dwarf trees.

ROSARIO STRAIT forms the eastern connection between the Strait of Juan de Fuca and the Gulf of Georgia, running northward between *Fidalgo Island* and that next westward, named *Lopez Island*, which will be described more particularly hereafter. Off *Cape Colville*, the S.E. point of *Lopez Island*, and on the West side of the entrance of this strait, and which is low and rocky, lies *Davidson Rock*, a very dangerous sunken rock, visible only at low tide, half a mile E. $\frac{1}{2}$ S. of *Colville Island*; and $2\frac{1}{2}$ miles to the northward is a very unsafe cluster of small rocks, some constantly and others visible only near low water. The strait varies from 5 to $1\frac{1}{2}$ miles in width.

On its eastern side, the coast of *Fidalgo Island* northward of *Deception Passage* is high, precipitous, and bare for 2 or 3 miles, and is known as *Sares Head*. To the northward of this is *Burrows Bay*, protected on its western side by *Alan* and *Burrows Islands*, half a mile off the South end of which are some detached rocks, 22 ft. high, named *Williamson Rocks*. *Alan Island*, about $3\frac{1}{2}$ miles north-westward of *Deception Islet*, is three-quarters of a mile in extent, and 200 ft. high, with its southern face partly bare. *Dennis Rock*, marked by kelp, lies a quarter of a mile off its S.W. side. *Burrows Island*, a quarter of a mile northward of *Alan Island*, is about $1\frac{1}{2}$ mile long, between 600 and 700 ft. high, with a remarkable flat top; *Young Islet* lies close off its S.E. side. There are deep channels between the islands, and vessels may anchor in the bay in about 10 fathoms, if necessary to await a favourable wind to pass through *Rosario Strait*.

Cypress Island lies in front of the opening of *Rosario Strait*, some 7 miles within it, and is 4 miles in length, rising to a height of 1,520 feet near its northern end. It obtained its name from producing an abundance of upright cypress trees. Its southern side consists of alternate white cliffs, and all ping ground covered with fern or trees. Rocks and foul ground, with much kelp, extend about half a mile from its S.W. point, towards *Burrows Island*.

On its western side, and at $1\frac{1}{2}$ mile from its S.W. point, is *Strawberry Bay*, so named by Vancouver from the great quantity of very excellent strawberries found there when Mr. Broughton first visited it. It is of small extent, and not very deep, but there is excellent anchorage in 6 to 10 fathoms, muddy bottom, behind the outlying rocky islet named *Strawberry* or *Hautboy*. When at anchor in 16 fathoms, fine sandy bottom, the South point of the bay bears

North Pacific.

S.E. $\frac{1}{4}$ S.; Strawberry Islet, round which is a clear good passage, West; and the bottom of the bay East, at the distance of about three-quarters of a mile. This situation, though very commodious in respect to the shore, is greatly exposed to the winds and sea in a S.S.E. direction. In fair weather wood and good water may be easily procured.

The strait here is only $1\frac{1}{2}$ mile wide, and from here will be seen *Bald Peak*, a perpendicular rocky peak, 750 ft. high, on the North end of Cypress Island.

Rock Islet is a small round islet, covered with trees, lying nearly 2 cables northward of the North end of Cypress Island, with a passage of 9 fathoms between. *Cypress Reef*, lying one-third of a mile W. $\frac{1}{4}$ S. from Rock Islet, is a dangerous rocky patch, with kelp growing about it, covering at half flood.

Sinclair Island, thickly wooded, and comparatively low, lies half a mile to the north-eastward of Cypress Island, with a deep passage between them, leading to Bellingham Channel. An extensive and dangerous shoal, the *Panama Reef*, extends nearly half a mile in a W.N.W. direction off its N.W. extreme, some parts of it uncovering at half-tide; a large boulder stands on the inner part of the reef. There is anchorage in 10 to 15 fathoms, half a mile off the North side of the island.

Guemes Island lies to the eastward of Cypress Island and North of Fidalgo Island, and to the eastward of these the main land forms *Padilla Bay*. Between Guemes and Cypress Islands is *Bellingham Channel*, leading towards Bellingham Bay.

BELLINGHAM BAY is separated from Padilla Bay to the South by a long narrow peninsula, of which William Point is the West extreme; the village of *Samish* is situated on the point. There are a number of channels leading into it through the cluster of islands before alluded to; and the bay itself extends about 12 miles N.W. and S.E. It everywhere affords good and secure anchorage. Opposite to its North point of entrance the shores are high and rocky, with some detached rocks lying off it. Here is a brook of most excellent water. To the North and South of these rocky cliffs the shores are less elevated, especially to the northward, where some beautiful verdant lawns are seen. The land generally is inconvenient for communicating with, on account of a shallow flat of sand or mud which extends a considerable distance off the land.

In the Spanish survey this bay appears in two portions, the northernmost being named *Gaston Bay*. This part is separated from the gulf by a long, narrow peninsula, terminating in Point Francis; an inlet lying in the middle of the bay is called *Puerto del Socorro*, and the southern part of the bay is called *Padilla Bay*, an appellation confined in the recent charts to that still farther South. Coal, or rather lignite, has been found and worked in the sandstone beds in Bellingham Bay, but of late years the mines have been very little worked, since the opening up of the Vancouver Island mines and those on Puget Sound.

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Directions.—Vessels bound for Bellingham Bay pass between Cypress and Guemes Islands, the channel running about 3 miles N. by W. $\frac{1}{2}$ W., and then to the eastward between Sinclair and Guemes Islands. At 2 miles N.E. of the North point of Guemes Island is *Vendovia Island*; pass North of this, and South of the small islet off Eliza Island, 2 miles to N.E. by N. from the N.W. point of Vendovia. If the current be flood, and the wind light, keep close around Guemes and Vendovia Islands, to avoid being set past Sinclair Island. From Eliza Island steer for the eastern shore, and follow its trend to the N.E. part of the bay, when the buildings will point out the position of the mines and the villages of *Schome* and *Whatcom*. Here there is anchorage at half a mile from the shore in 4 fathoms, soft bottom, in very smooth water.

Lummi Island, off the N.W. point of Bellingham Bay, is 8 miles long, and very narrow. On its south-western side it is high and precipitous, a remarkable double mountain rising 1,360 ft. abruptly from the sea. There are no dangers off its western side, and on its eastern side is the N.W. channel into Bellingham Bay. Abreast Clark Island there is a contracted anchorage in 10 to 15 fathoms, and shelter from northerly winds, on the West side of Lummi Island, under a low point named *Village Point*.

Whitehorn Point is a remarkable bold bluff, about 150 ft. high, its face showing as a steep white clay cliff. It is the southern point of Birch Bay, and is 9 miles N.W. $\frac{1}{2}$ N. of the North point of Lummi Island, and N.E. by N. distant 10 miles from the entrance of the strait, between East Point and Patos Island.

Birch Bay is between Whitehorn Point and South Bluff, 3 miles to the N.W.; the latter, which is a moderately high rounding point, forms the North entrance point of the bay. Some large boulder stones stand a short distance off it, and should not be rounded at a less distance than half a mile. The bay runs in a N.N.E. direction for $2\frac{1}{2}$ miles. The holding ground is good, in 4 to 10 fathoms, and with S.E. gales it affords excellent shelter. A good berth is with Whitehorn Point bearing South, distant a mile, in 4 fathoms.

Semiahmoo or Boundary Bay is an extensive sheet of water between the promontory of Roberts Point on the West, and South Bluff on the East, which bear W. by S. and E. by N. of each other, 8 miles apart. The bay extends in a northerly direction for nearly 7 miles, and is only separated from the South bank of Fraser River by a low delta 3 miles across, intersected by streams and swamps. All its upper part is shallow, and dries off for 3 miles at low water.

Vessels should never stand so far to the northward as to bring the white bluff of Roberts Point to bear to the southward of S.W. by W., which line of bearing leads less than half a mile outside the shoal edge of the bank; the general depth of water outside this line is from 7 to 15 fathoms, good holding ground. It is high water, on full and change, at 4^h 50^m; springs rise nearly 11 feet.

The boundary between Washington Territory and British Columbia is marked on the shore, and also along the parallel of 49° , by iron beacons or pillars, set up by Capt. Richards, in July, 1861.

Drayton Harbour, at $3\frac{1}{2}$ miles N. by E. of South Bluff, is formed by a remarkable low narrow spit, over a mile long, which is the termination of the bluff itself. The spit is covered with grass and drift timber, and a few pine trees grow on it. Several wooden buildings were erected on it in 1858, and received the name of Semiahmoo City.

There is 5 fathoms water in the entrance, but the channel is narrow, and no vessel unacquainted with the locality can enter, unless by placing boats or poles on the edges of the shoals.

The northern shore of Juan de Fuca Strait will be described in the next Chapter.

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CHAPTER VI.

VANCOUVER ISLAND, ETC.

PRIOR to 1789 the outer coast of this island was supposed to be that of the American continent, but in that year its insular character was established.

The first intimation in Europe of the existence of the channel which separates Vancouver Island from the continent was in the observations prefixed by Capt. Meares to the Narrative of his Voyages. In the chart accompanying that work there is a sketch of the track of the American sloop *Washington*, in the autumn of 1789, which is that through the inland navigation presently described. The name of the commander is not given; but it was naturally supposed that Capt. Gray, of the *Columbia*, previously mentioned, was the person. In the angry discussion which ensued between Meares and Dixon relative to the remarks of the former, it is stated that Mr. Kendrick was the commander of the *Washington*, who perhaps took it after it had been quitted by Gray. Therefore Kendrick,* in the sloop *Washington*, must be taken as the person who really made known the real character of the territory in question, after the formerly discredited voyage of its discoverer, De Fuca, in 1592.

Vancouver reached the coast in March, 1792, and after navigating through the strait to the eastward, he applied the names Quadra and Vancouver Island to it; the first name in compliment to the Spanish commandant at Nootka Sound, from whom he received much politeness during the negotiations relative to the restoration of the tract of country claimed by Great Britain, as mentioned hereafter. The first name, however, has been dropped, and that of the surveyor only retained for it, which is certainly preferable, as the Spanish governor took no part in its geographical advancement.

It remained in the same state, untenanted by Europeans during many subsequent years, until later events gave it a new existence. It was only visited, at regular intervals, on its north-eastern side, by the officers and agents of the

* Kendrick never returned to Europe. He was killed in 1793, in Karakakooa Bay, by a ball accidentally fired from a British vessel while saluting him.

Hudson's Bay Company for the trade in furs and other commodities collected by the natives, and at Nootka Sound, on its S.W. side, for refreshments, &c., by the vessels in the North Pacific.

When, however, the treaty which severed Oregon and Washington Territory from Great Britain, and the thriving settlements established therein by the Hudson's Bay Company became surrounded by a foreign power and interest, Vancouver Island assumed a fresh importance to English commerce.

The British crown granted the dominion of Vancouver Island to the Hudson's Bay Company by letters patent under the great seal, and dated January 13th, 1849, which gave the absolute lordship and proprietorship of the whole island, with its mines, &c., to the Hudson's Bay Company, at the yearly rent of seven shillings.

In the course of time several difficulties and questions arose between the British Government and the Hudson's Bay Company, relative chiefly to the lands occupied by the latter prior to 1849, and it was deemed advisable that the government should regain the possession of the island, reserving to the Company, and those to whom they had disposed of the land, all previous rights, and thus, by mutual agreement, it reverted to the Crown on February 3rd, 1862.

The prosperity of the island did not advance as was anticipated, and the superior attractions of the gold-fields of British Columbia no doubt tended to add to the depression felt, especially in 1866. A further anomaly existed in the different policy maintained in these two adjacent young colonies, and, after much strong feeling on both sides, the two colonies were united, or rather Vancouver Island was attached to British Columbia by Act of Parliament, 1866, a measure proclaimed in Victoria, its capital, on November 19th in that year. The question of the future capital of the united colonies was then mooted, and the decision was arrived at that New Westminster, proclaimed the capital of British Columbia February 14th, 1859, must give way to the superior advances and general commercial interest which belonged to Victoria. This town was proclaimed as the capital on May 25th, 1868. In 1871 the province of British Columbia was admitted into the confederation of the Dominion of Canada.

In the subsequent description we commence with the Haro Archipelago, which lies to the S.E. of Vancouver Island, between it and Washington Territory of the United States. This congeries of islands and channels, so little known and so little valued at the time, has been the subject of very serious controversy and complication between the two nations, the United States and Great Britain, threatening at one time to involve them in a war.* At the time of the treaty which separated Oregon from Great Britain, the charts showed

* This subject is ably discussed in the "History of the San Juan Water Boundary Question," by Viscount Milton, 1879.

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only two channels, the eastern one, that of Rosario, being the only one used, and the other marked on the old Spanish maps as the Canal de Haro, but almost unknown and quite unused.

The vague wording of the treaty of 1844 said that "the channel" should be the separation between the two territories, meaning, as is maintained, the Canal de Rosario. But the United States Government, as soon as the country became valuable, insisted that Haro Channel was "*the* Channel," and thus claiming the Island of San Juan as included in their territory. This island is the only one worth having for colonization, as it commands all the channels leading to the country of British Columbia, as well as the harbour of Victoria, from which it is distant only 5 or 6 miles. In order to adjust these rival claims, Capt. G. H. Richards, R.N., arrived here in November, 1859, in H.M.S. *Plumper*, for the purpose of making a detailed survey, and fixing the boundary on the parallel of 49° N. The results of this exhaustive examination showed that, instead of one or two channels, there are *three* principal passages through the archipelago, and with very numerous ramifications from each. In 1872 this question was submitted to the arbitration of the Emperor of Germany, who decided in favour of the United States.

THE HARO ARCHIPELAGO.

The **HARO ARCHIPELAGO** lies in the space separating Vancouver Island from the continent, the distance between them being about 20 miles, and the islands covering a space of about 400 square miles in area. There are three more important islands, San Juan, the westernmost and best, Orcas, the northernmost and largest, and Lopez the southernmost. There are about thirty minor islands and innumerable rocks, mere masses of trap rock covered with pines.

The subsequent description taken, with some abridgments, from the *Vancouver Island Pilot*, drawn up by Capt. G. H. Richards in 1864, and from other and later sources of information, commences with the south-easternmost portion, as following in geographical order the previous descriptions.

ROSARIO STRAIT.

ROSARIO STRAIT is the easternmost and one of the principal channels leading from the Strait of Fuca into that of Georgia. Its southern entrance lies between Lopez and Fidalgo Islands, before described, and from thence its general direction is from N.N.W. to N.W. for 25 miles, when it enters the latter strait. Its eastern side has been briefly described on pp. 345-6.

Like Haro Strait, the Rosario has several small channels which branch off to the eastward, and lead between islands to the United States settlements in Bellingham Bay, or by a more circuitous route into the Strait of Georgia itself.

The breadth of the strait varies from 5 miles to something less than $1\frac{1}{2}$ mile, the narrowest part being between Blakely and Cypress Islands. The depth varies from 25 to 45 fathoms, occasionally deeper.

The tides are strong, from 3 to 7 knots in the narrower parts. The principal dangers are the Bird and Belle Rocks, which lie almost in the centre of the strait, 4 miles within the southern entrance. There are several anchorages available for vessels delayed by the tides or other causes. The ebb tide here, as in the narrower straits, runs from 2 to $2\frac{1}{2}$ hours after low water.

LIGHT.—On the summit of *Smith or Blunt Island* (see p. 344), near the West end, is a lighthouse, 35 ft. high, painted white, with a red lantern, which shows, at an elevation of 90 ft. above the sea, a *bright light, revolving every half minute*, and visible 15 miles.

Having made Smith Island, which vessels bound from sea up Rosario Channel should do on about a N.E. $\frac{1}{2}$ E. bearing, it may be passed on either side. When New Dungeness light bears S. by W. keep it so astern, steering N. by E., which leads midway between Smith Island and *Fonte Bank*, an extensive kelp patch lying W. by S., $8\frac{1}{2}$ miles from it, on which the least water yet found is $3\frac{1}{2}$ fathoms. When to the northward of the patch, a course may be steered for the entrance of the strait, which, however, should not be entered at night. If passing to the southward of Smith Island, avoid two kelp patches of 5 fathoms and less water nearly 3 miles S.S.E. from the light, and 4 miles W. by N. from Partridge Point, a remarkable white-faced cliff on the main. Vessels from the southern parts of Vancouver Island, bound up Rosario Strait, should of course pass northward of Smith Island.

CAPE COLVILLE, the south-eastern extreme of Lopez Island, is the western entrance point of Rosario Strait, which is here $4\frac{1}{2}$ miles wide. *Wal-mouth Hill*, flat-topped, and about 500 ft. high, rises immediately over it. *Colville Island*, small, and bare of trees, about 50 ft. high, lies southward of the cape, distant half a mile. Entering the strait, Colville Island should be given a berth of a mile. Some other rocky islets lie between it and the cape.

Davidson Rock, drying 4 ft. at low water springs, lies East a little more than 3 cables from the East end of Colville Island, and South nearly a mile from the cape itself. Kelp grows about the rock, but the patch is so small that it is difficult to make out, the kelp being run under by the current.

Kellett Island is a small flat-topped islet, covered with grass, and lying immediately northward, and close off the low extreme of Cape Colville. *Cape St. Mary*, the next point northward of Cape Colville, and a little more than a mile from it, forms the southern point of Davis Bay. *Hulah Rocks*, or *Kellett Ledge*, uncovered at low water, and marked by kelp, lie 3 cables N.E. by N. of Cape St. Mary. There is a deep passage between them and the cape. Vessels passing outside them should give the cape a berth of a long half mile.

Davis Bay affords good and convenient anchorage in a moderate depth of water. After rounding Hulah Rocks, a vessel may stand to the westward into

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the bay, and anchor in 6 fathoms, mud, little more than half a mile from the shore. A kelp patch, on which there is shoal water, lies N. by W. a mile from the cape. There is anchorage in from 4 to 8 fathoms anywhere within a mile of the East shore of Lopez and Decatur Islands.

Bird Rock, lying almost in the centre of Rosario Strait, is composed of three detached rocks close together, the southernmost being the largest, and 20 ft. above high water. From Cape Colville it bears N. $\frac{1}{4}$ E. nearly 4 miles, and from the South end of James Island, S.E. by S. $1\frac{1}{2}$ mile. There is deep water close to it, but on account of the strength of the tides, sailing vessels working up or down, particularly during light winds, are recommended to give it a berth of half a mile.

Belle Rock is the most serious danger in Rosario Strait, because it only uncovers near low water, and the tides run over it from 2 to 5 knots. It lies N. by E. $\frac{1}{2}$ E. distant 6 cables from Bird Rock, and the passage between the two rocks carries from 8 to 20 fathoms, but vessels are recommended not to take it except in cases of necessity, on account of the tides. Belle Rock is easily avoided by day. The great danger of it to a sailing vessel is being left with a light wind in the centre of the strait, as the water is too deep with much prospect of an anchor holding in so strong a tideway.

James Island, almost divided in the centre, is a remarkable saddle island, with two summits, 250 ft. high, lying close off the East side of Decatur Island. There are no dangers on its eastern side.

Blakely Island rises to an elevation of 1,044 ft. in its northern part; its eastern part, opposite Strawberry Island, is bold and rocky, rising to between 900 and 1,000 ft. *White* and *Black Rocks* are three quarters of a mile apart, and lie off the S.E. shore of Blakely Island. *White Rock* the southernmost, is 6 or 8 ft. above high water, and a little more than a quarter of a mile from the shore at the eastern entrance of Thatcher Passage (p. 361). *Black Rock*, just awash at high springs, lies N.E. by N. from *White Rock*, and half a mile from Blakely Island. There is a deep channel between these rocks, as also between them and Blakely Island.

The **Peapods** are two small rocky islets, bare of trees, lying half a mile from the western shore of Rosario Strait, and $1\frac{1}{2}$ mile southward of Lawrence Point, the eastern extreme of Orcas Island. They are three-quarters of a mile apart in a N.N.E. and S.S.W. direction, the northernmost being the largest and highest. A little to the westward of a line drawn between them is a third rock which just covers at high water. There are no dangers about them which are not visible.

ORCAS ISLAND is the most extensive of the group known as the Haro Archipelago, and contains the finest harbours. It is mountainous and in most parts thickly wooded, although in the valleys there is a considerable portion of land available for agricultural purposes, and partially clear of timber. Its

North Pacific.

southern side is singularly indented by deep sounds, which in some places almost divide the island. This is particularly the case in the East Sound, separated only from the waters of the Strait of Georgia by a low neck of land a mile across. On the eastern side of this sound, *Mount Constitution* rises to an elevation of nearly 2,500 ft., wooded to its summit. Deer abound on the island; coal, also, of inferior quality, is found here.

The eastern side of Orcas Island, between the Peapod Islets and Obstruction Pass, falls back in a bight, where there is considerably less tide than in the main stream of the strait, and if necessary a vessel may drop her anchor within half a mile of the shore in about 16 fathoms.

Lawrence Point, the eastern extreme of Orcas, is a long sloping point, the termination of the ridge of Mount Constitution. Immediately on its North side it rises abruptly in high, almost perpendicular cliffs, and trends to the westward, falling back for 3 miles in a somewhat deep bight, which is rocky, has deep water, and is unsheltered.

Rosario Strait now lies between Orcas and Lummi Islands, the direct channel being along the western shore of the latter in a N.W. $\frac{1}{2}$ W. direction, passing between it and Barnes and Clark Islets. Anchorage may be had, if necessary, within a mile of the shore in 15 fathoms, between Sandy and Whitehorn Points, northward of Lummi Island. This last island has been briefly described on page 347.

Tides.—After passing northward of Lawrence Point, the ebb tide will be found to set to the eastward between Orcas and the small islands to the northward of it, as well as to the S.E. through the northern entrance of the strait. When as high as Alden Bank, or about 8 miles above Lawrence Point, the strength of the tides sensibly decreases, and while a vessel is eastward of a line between this bank and Roberts Point, she will be entirely out of the strong tides of the Archipelago and the Strait of Georgia. It is recommended with the ebb tide to work up on this shore.

Clark and Barnes Islands are two small wooded islands, 2 miles N.W. of Lawrence Point. Two smaller islets, *The Sisters*, bare of trees, and a high rock lie immediately S.E. of Clark Island. There is a passage $1\frac{1}{2}$ mile in breadth between these islands and Orcas with a depth of 45 fathoms. The tides set strong about the Sisters, and the best and most direct channel is between Clark and Lummi Islands.

Matia Island, 3 miles W.N.W. from Clark Island, and $1\frac{1}{2}$ mile eastward of Sucia Island (which is 2 miles off the North side of Orcas Island), is a mile in length, East and West, moderately high and wooded. Close off its East point is *Puffin Islet*, and extending a short distance eastward of the islet is a flat covering rock. Vessels bound through Rosario Strait are recommended to pass eastward of Matia.

ALDEN BANK, 2 miles in extent North and South, and 1 mile East and West, lies in the centre of the northern entrance of Rosario Strait. Its

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southern limit is 2 miles North of Matia Island, and there is a channel 3 miles in breadth between it and the eastern shore.

The depth of water on this bank varies from 3 to 7 fathoms, and in one spot so little as 14 ft. is found. The bottom is in some parts rocky, with patches of kelp growing on it; in other parts it is sandy, and offers a convenient anchorage for vessels becalmed or waiting for tide.

Vessels passing up or down are recommended to pass on the eastern side of the bank.

THE MIDDLE CHANNEL.

MIDDLE CHANNEL is the centre of the three passages leading from the Strait of Juan de Fuca into that of Georgia, and is bounded by San Juan Island on the West, and the islands of Lopez, Shaw, and Orcas on the East. Although a deep navigable ship channel, and eligible for steamers of the largest size, the southern entrance is somewhat confined, and subject to strong tides, with a general absence of steady winds; the wide straits of Rosario and Haro, on either side of it, are therefore far to be preferred for sailing vessels above the size of coasters.

The general direction of the channel is N.N.W. for 5 miles, when it trends to the W.N.W. for 7 miles to its junction with Douglas Channel. The southern entrance lies between the S.E. point of San Juan and the West point of Lopez Island. In entering, the danger to be avoided on the western side is Salmon Bank, extending southerly from San Juan; and on the eastern side Whale Rocks, always out of water. The tides in this entrance run from 3 to 7 knots, with eddies and confused rippings.

Salmon Bank extends $1\frac{1}{2}$ mile South from Cattle Point, a bare point about 50 ft. high, the sloping termination of Mount Finlayson, and the S.E. extreme of San Juan Island; the least depth of water found on it is 10 ft., with rocky patches, marked in summer by kelp.

Whale Rocks, on the eastern side of the entrance, are two black rocks a cable's length apart, and 3 or 4 ft. above high water. A patch, on which kelp grows, with 1 fathom on it, extends 2 cables S.E. of them, otherwise they are steep-to, but it is not recommended to pass them nearer than a quarter of a mile, as the tides set strongly over them.

Directions.—In entering Middle Channel from the westward or southward, Cattle Point should be given a berth of at least $1\frac{1}{2}$ mile. Mount Erie, a remarkable summit on Fidalgo Island, 1,250 ft. high, in line with Jennis Point N.E. by E. $\frac{1}{2}$ E., leads $1\frac{1}{2}$ mile South of Salmon Bank in 13 fathoms; when the entrance of the channel is open, bearing N.N.W., or when Goose Island, a small islet on the western side of the entrance, is in one with Turn Island, and Orcas Nob bearing N.W. by N. $\frac{1}{2}$ N., a vessel will be well to the eastward of the bank, and may steer in for the passage. *Orcas Nob* is a remarkable conical

hill, with a bare stony summit, 1,100 ft. above the sea, rising over the West side of Orcas Island.

Griffin Bay is an extensive indentation on the eastern side of San Juan, immediately within the southern entrance of Middle Channel. Although so spacious, yet from the great depth of water there is but a limited portion of the bay available for anchorage, and this is in the southern angle, immediately off the remarkable prairie land between two forests of pine trees. *Half-tide Rock*, just awash at high water, lies W. $\frac{1}{4}$ N., distant $1\frac{1}{2}$ mile from Harbour Rock, and 4 cables from the western shore of the bay. There is another rock, which only uncovers at or near low water, lying S.E. $\frac{1}{2}$ S. $4\frac{1}{2}$ cables from Half-tide Rock, and N. $\frac{1}{2}$ W. a third of a mile from the pier on the beach.

With all westerly or southerly winds, Griffin Bay affords good shelter; but with those from North or N.E. it is considerably exposed. A stranger should drop an anchor directly 12 fathoms is struck. *North Bay*, in the N.W. angle of Griffin Bay, immediately under Park Hill, a bare grassy eminence, about 180 ft. high, affords good anchorage in 4 to 10 fathoms, with all winds but those from S.E., to which it is somewhat exposed.

The greatest rise and fall at the southern entrance of Middle Channel, on full and change, is 12 ft.; but little stream is felt at the anchorages.

Turn Island lies N.W. by N., nearly 5 miles from the South entrance of Middle Channel. *Turn Rock* lies nearly a quarter of a mile N.E. of the island, and covers at three-quarters flood. The tide runs with great strength over this rock, and vessels passing up or down the channel are recommended to give it a good berth.

Friday Harbour is on the North side of the peninsula, immediately opposite to North Bay; it is rather confined, but offers good anchorage, and is easily accessible to steamers or small vessels. There is a village here. *Brown Island* lies in the entrance, and there is a passage on either side of it. The passage in, westward of Brown Island, is the widest and best, being 3 cables across. In the centre of the entrance there is a rocky patch, with $3\frac{1}{2}$ fathoms at low water. Anchor with the passage between the island and the main open, and the West cliffy point of the former bearing N.E. in 9 fathoms.

Reid Rock.—After rounding Turn Island, Middle Channel trends to the westward, and Reid Rock lies in the fairway; the least water on it is 12 ft., and it is surrounded by thick kelp, which, however, is sometimes run under by the tide. The rock bears from the North point of Turn Island W.N.W. 1 1-10th mile, and from the N.W. cliffy point of Brown Island N.E. by N. $\frac{1}{4}$ N. three-quarters of a mile. There is a clear deep channel on either side of it. After passing Reid Rock, there are no dangers which are not visible.

On its eastern side is the group known as the *Wasp Islands*, between and among which is several passages leading between Shaw and Orcas Islands, and communicating with the magnificent harbours and sounds which deeply indent the southern coasts of the latter.

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On the western side of Middle Channel, 4 miles from Caution Point, is *Rocky Bay*, with the small island of *O'Neal* lying in the centre of it. The bottom is rocky, and as the bay does not afford much shelter, vessels are not recommended to use it unless in case of necessity.

Jones Island lies in the northern entrance of the channel, on the eastern side, nearly half a mile from *Orcas*, being separated from the latter island by *Spring Passage*. The island is generally wooded, but its western points are bare and grassy.

Spring Passage, between *Jones Island* and the West side of *Orcas Island*, is a safe deep water channel, and saves some distance to a steamer passing up or down Middle Channel, by *Douglas Channel*. Some rocky patches extend a cable off the south-eastern side of *Jones Island*; and a rock, which covers at 2 feet flood, lies the same distance North of a small cove on the N.E. side of the island; so it is desirable to pass through in mid-channel; the western side of *Orcas Island* has, however, no dangers off it.

Flat-top Island is in the northern entrance of Middle Channel, N.W. by W. 2 miles from *Jones Island*; it is one-third of a mile in length, wooded, and about 100 ft. high. Off its western side, distant 2 cables, is a rock, nearly a cable in extent, and 15 ft. above high water.

DOUGLAS CHANNEL may be said to be the continuation of Middle Channel, and leads into *Haro Strait*, between *Orcas* and *Waldron Islands*. There are other passages leading into the *Haro*, viz., westward of *Flat-top Island*, between it and *Spieden* and *Stuart Islands*; and eastward of *Flat-top*, between it and *Waldron Island*. In the former the confused tides and eddies are liable to entangle a sailing vessel among *Spieden* and the neighbouring groups of small islands and rocks; in the latter, *White Rock*, with its off-lying dangers, offers serious impediments to the safe navigation of the same class of vessels.

Both shores of the channel are free from danger. If necessary, vessels will find a stopping place in the bay southward of the Bill of *Orcas* in 12 fathoms.

The channel eastward of *Flat-top Island*, between it and *White Rock*, is about the same breadth as the one to the West of it, but *Danger Rock*, with 5 feet on it, which lies a little over a quarter of a mile S.E. by E. $\frac{1}{2}$ E. from the centre of *White Rock*, must be carefully avoided.

If passing between *White Rock* and *Disney Point* (the high stratified cliff of *Waldron Island*), the latter should be kept well aboard if the ebb is running, or a stranger is liable to be set on the rock.

It should be observed that the ebb stream continues to run down through the whole of the passages in the Archipelago for two hours after it is low water by the shore, and the water has begun to rise.

Patos Island, $1\frac{1}{2}$ mile long, lies $2\frac{3}{4}$ miles E.N.E. from the East point of *Saturna*, on the South side of the Gulf of Georgia; the passage between them being the widest, and at present most frequented, though not always the best channel from *Haro* or *Middle Channels* into the Strait of Georgia. *Active Cove*,

at its western end, is formed by a small islet connected at low water, and affords anchorage for one or two small vessels.

The passage into the Strait of Georgia between Patos and Sucia Islands, although considerably narrower than the one just mentioned, is for several reasons at times to be preferred, especially for vessels passing through Middle Channel, or for sailing vessels with a N.W. wind.

If intending to take the passage between Patos and Sucia, either up or down, an excellent mark for clearing the *Plumper* and *Clements Reefs*, which are dangerous patches (presently described), lying southward and northward of Sucia, is to keep the remarkable round summit of *Stuart Island*, 650 ft. high, just open westward of *Skipjack Island*, the westernmost wooded island North of Waldron; this leads well clear of both the reefs, and the same course, N.E. $\frac{3}{4}$ N., continued, would cross Alden Bank in 5 fathoms.

If taking the passage from Middle or Douglas Channels, keep the white faced cliffs of Roberts Point well open westward of Patos Island, or keep the West end of Patos Island on the starboard bow until the marks before described are on, when steer through the passage. If the ebb stream is running, it is better to keep the Patos Island shore aboard; 16 fathoms will be found on the Sucia shore, but it is not recommended to anchor unless positively necessary.

In standing to the north-eastward, when Clark Island is open of the East end of Matia, or Puffin Islet, a vessel will be eastward of Clements Reef.

SUCIA ISLAND is of a horse-shoe shape, remarkably indented on its eastern side by bays and fissures, running in an East and West direction; the largest of these, *Sucia Harbour*, affords fair anchorage in 10 to 15 fathoms, mud bottom, open to the East. The island is from 200 to 300 ft. high, thickly covered with pines, and its western side a series of steep wooded bluffs. The dangers lying off it are *Plumper* and *Clements Reefs*; the former has 10 ft. water on it, and lies S.W. by S., $1\frac{1}{4}$ mile from Lawson Bluff, the highest N.W. point of the island; N.N.W. $2\frac{1}{4}$ miles from the Bill of Orcas, a remarkable bare knob point on the island of that name; and S. by E. nearly 2 miles from the East point of Patos Island. There is a deep passage between *Plumper Reef* and Sucia, but it is not recommended.

Clements Reef has 9 ft. on it, and lies N.E. $\frac{1}{4}$ N., $1\frac{1}{4}$ mile from Lawson Bluff; N.W. $\frac{1}{4}$ W., 1 mile from Ewing Island, the N.E. point of Sucia; and E. $\frac{1}{4}$ N., 2 miles from the East end of Patos. Some rocky patches, covering at high water, and marked by kelp, lie between Clements Reef and Ewing Island, and it is not safe to pass between them. There is a deep channel of more than a mile in breadth between Sucia and Matia, the island to the eastward of it.

Parker Reef is a considerable patch lying in the passage between Sucia and Orcas Islands, and at low water uncovers a quarter of a mile of rock and sand; its eastern end always shows its rocky summit above water, and bears from Nob Point or Orcas Bill N.E. $\frac{1}{4}$ E., $2\frac{1}{4}$ miles, and from the East point of Sucia, S. $\frac{1}{4}$ E., $1\frac{1}{2}$ mile. There is a passage on either side of the reef; that to the

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southward, between it and Orcas, is half a mile wide, but a stranger is recommended not to use it.

Matia Island, a little more than a mile eastward of Sucia, has been before alluded to.

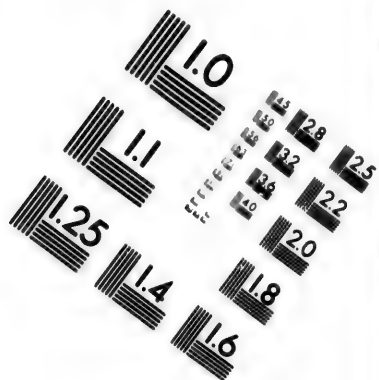
LOPEZ ISLAND.—We now return to the islands and passages on the eastern side of Middle Channel. Lopez is the southernmost of the islands, and helps to form the western side of Rosario Strait, as it does the eastern side of Middle Channel. It is 9 miles long, North and South, 3 miles wide, East and West, and thickly wooded, but differs from all the other islands of the Haro Archipelago in being much lower and almost flat, except at its northern and southern extremes, where elevations occur of a few hundred feet. Its southern side is a good deal indented by bays and creeks, which, however, from their exposed position and rocky nature, cannot be reckoned on as anchorages. On its western side, in Middle Channel, is a creek terminating in an extensive lagoon, the former offering great facilities for beaching and repairing ships. On the North shore is Shoal Bay, affording anchorage; and on the East is the spacious and excellent sound of Lopez, which has an entrance from Middle Channel, as well as three distinct passages from Rosario Strait.

McKaye Harbour is on the South coast of Lopez Island, 2 miles eastward of the entrance to Middle Channel. It is entered between *Jennis Point* on the South, and *Long* and *Charles Islands* on the North; from the latter it runs easterly for a mile, and then trends to the southward for a short distance, terminating in a low sandy beach. In the entrance there is from 8 to 12 fathoms, muddy bottom, but with the prevailing south-westerly winds the anchorage is a good deal exposed. Coasters or small vessels drawing 12 ft. may get shelter in the South bight; with northerly or easterly winds there would be fair anchorage.

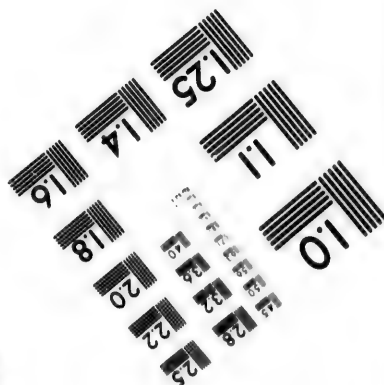
Shark Reef, on the western side of Lopez Island, immediately within Middle Channel, and half a mile northward of White Cliff, consists of two rocks generally awash, extending something more than a cable off shore, and which must be avoided by vessels working up the channel. There are no dangers on the coast of the island above this reef.

Careen Creek, on the West side of Lopez Island, is 4 miles within the entrance of Middle Channel. The western entrance point is a low sandy spit, close round which there is 3 fathoms, and on it a vessel might be beached and repaired with much facility, and perfectly sheltered; the creek terminates in a large salt lagoon.

Upright Channel, separating Lopez from Shaw Islands, is a deep steep passage leading from Middle Channel to the sounds of Orcas and Lopez, and by several passages into Rosario Strait. The narrowest part of the entrance is between *Flat Point* and *Canoe Island*, where for a short distance it is scarcely 2 cables in breadth. A rock lies a cable South of the South point of Canoe Island, marked by kelp. The tides are not considerable in the channel. At



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1½ mile from Flat Point, on the South side of the channel, is Upright Hill, the steep cliffy North extreme of Lopez Island. It is covered with timber, and from 200 to 300 ft. high.

Shoal Bay lies immediately eastward of Upright Hill, and runs in a S.S.E. direction for a mile to its head, which is separated from False Bay, in Lopez Sound, by a low neck a cable's length across. Although apparently a considerable sheet of water, the anchorage for large vessels is much limited by a shoal which extends from just within the point of Upright Hill towards the eastern point of the bay, and more than half-way across.

LOPEZ SOUND, on the eastern side of the island of that name, runs in a S.S.E. direction for 7½ miles, or nearly the whole length of the island, its head reaching within half a mile of the waters of Fuca Strait. Its eastern side is formed partly by Lopez and partly by Decatur and Blakely Islands, lying parallel with it; and between these islands, as well as northward of the latter, are passages leading into Rosario Strait. The average breadth of the sound is nearly 1½ mile, and there is a convenient depth of water for anchorage in almost every part of it.

The sound may be entered from the westward through Middle and Upright Channels, and from the eastward by Obstruction Passage, or by Thatcher and Maury Passages.

Until as far South as *Frost Island*, which is nearly 2 miles within the entrance of the sound, the general depth of water is from 20 to 30 fathoms. Thatcher Passage, leading into Rosario Strait, between Blakely and Decatur Islands, now opens out, and in proceeding up the sound the depth soon decreases to 9 fathoms, varying between that and 5 fathoms for a distance of 2½ miles, or as high as Houston Island. The only impediment between Frost and Houston Islands is *Middle Bank*, on which, however, there is not less than 3 fathoms at low water. It is half a mile in extent North and South, 2 cables East and West, and lies almost in the centre of the sound, its North end bearing S.S.E. a quarter of a mile from the South end of Frost Island, and S.W. by W. ¼ W. 1½ mile from the North entrance point of Thatcher Passage, or South point of Blakely Island.

Entrance Shoal, with 2 fathoms on it, and marked by kelp, must be avoided by vessels working in. It lies E. by N. ¼ N. 1½ mile from Upright Point, and half a mile from the shore of Blakely Island; there is deep water on either side of it.

False Bay is on the West side of the sound, a mile from Shoal Bay, their heads being only separated by a low narrow neck, 200 yards across, the cliffy extreme of the peninsula being *Separation Point*. It is unfit for anchorage, except for small vessels. *Half-tide Rock*, covering at half-flood, and not marked by kelp, is in the track of vessels entering. It lies S.E. by E. ¼ E. three-quarters of a mile from Separation Point, and N.W. by N. ¾ N. 4 cables from Arbutus Island. *Frost Island* lies close off Gravel Spit on the West side of the sound.

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It is wooded, and its western side is a steep cliff, between which and the spit end there is a narrow channel of 5 fathoms.

Black Islets are a ridge of steep rocky islets, lying within and across the entrance of Maury Passage. At 2 cables S. by W. from the southernmost of these islets is a rock which covers at quarter-flood. There is good anchorage in 5 fathoms in the bight, westward of *Crown Islet*.

THATCHER PASSAGE, between Blakely and Decatur Islands, is the widest and most convenient passage into Lopez Sound from Rosario Strait. It is $1\frac{1}{2}$ mile in length, and its narrowest part 4 cables wide, with a general depth of from 20 to 25 fathoms. *Lawson Rock*, lying almost in the centre of the eastern entrance, is the only danger, and covers at 2 ft. flood. There is a good passage on either side of the rock; that to the southward is the best.

Maury Passage, between Decatur Island and the S.E. part of Lopez, is the southernmost entrance to the sound from Rosario Strait. It is scarcely 2 cables wide at the entrance, with a depth of 12 fathoms. *Black Islets* lie across the western entrance, and it is necessary to keep to the southward, between them and Lopez.

Obstruction Passages.—Obstruction Island lies in the centre of the channel, between the North point of Blakely and the S.E. point of Orcas Island, and forms a safe and convenient communication on either side of it, between Middle Channel and Rosario Strait by Upright Channel; they likewise lead from Rosario Strait to the Sounds of Orcas and Lopez. The passes are more adapted to steam than sailing navigation, although there would be no difficulty to a sailing vessel with a leading wind and fair tides. Small vessels would never find any difficulty by studying the tides.

North Obstruction Pass is about $1\frac{1}{2}$ mile long, and its average breadth 2 cables. There are no dangers which are not visible. The eastern entrance bears from Cypress Cone, a remarkable bare peak on the North end of Cypress Island, W.S.W.

South Obstruction Pass, though narrower than the North, is perhaps the better channel of the two. It is not above three-quarters of a mile in length, and is perfectly straight; its direction N.E. and S.W. In its narrowest part it is not much over a cable wide. On the South side of the eastern entrance two rocks extend off Blakely Island, the inner one always above high water; the outer, a long black rock, is nearly a quarter of a mile off shore, and just awash at high water.

SHAW ISLAND is much of the same character as Lopez, though considerably smaller, being about 3 miles in extent, measured in any direction. It is the continuation of the eastern side of Middle Channel, and between it and Orcas Island lie the Wasp group, among which are several passages leading to the harbours of Orcas and Lopez, and into Rosario Strait.

Wasp Islands, five in number, besides some smaller islets and rocks, lie on *North Pacific*.

the eastern side of Middle Channel, between Shaw and Orcas Islands. *Yellow Island*, the westernmost of the group, is rather remarkable from its colour, grassy, and nearly bare of trees, the remainder of the group being wooded. From its West end a sandy spit extends for a cable's length, with a rock on the extreme, bare at low water, and round which kelp grows; therefore, this point should be given a berth in passing up or down Middle Channel. Northward of Yellow Island are *Brown* and *Reef Islands*; off the West side of the latter a reef extends for more than a cable's length. *Wasp Passage* leads through this group to the sound of Orcas and to Rosario Strait. With the assistance of the chart a steamer would find but little difficulty in passing through it, though the passage by Upright Channel is to be preferred.

If desired, a vessel may pass into Wasp Channel to the southward of Yellow Island, between it and Low Island, a small islet, thence northward of Nob Islet, and as before directed, between Crane and Cliff Islands.

There is yet another passage into Wasp Channel southward of Cliff Island, between it and Neck Point, the remarkable western extreme of Shaw Island. These two latter passages are the shortest into Wasp Channel for vessels from the southward. The eye will be found the best guide; a good lookout is necessary, and to a steamer there is no difficulty.

North Passage.—This clear, deep channel leading to Deer Harbour, the westernmost port in Orcas Island, lies between Steep Point, the S.W. point of Orcas, and Reef Island, the northernmost of the Wasp group. It is nearly a quarter of a mile wide, and 20 fathoms deep, and the only danger to avoid in it is the reef off the West side of the latter island. Deer Harbour may be entered equally well between Reef and Brown Islands. A patch of 2 fathoms lies S.W. by W. nearly a cable from the N.W. point of the latter.

ORCAS ISLAND, the largest of the archipelago, has been before noticed, as forming the western side of Rosario Strait. Its most elevated part, Mount Constitution, 2,486 ft., is on the eastern side. On the West side is *Turtle Back*, a long wooded range, 1,600 ft., and West of it again, rising immediately over the sea, that singular bare-top cone known as *Orcas Nob*, a remarkable object when seen either from the North or South.

The ports of Orcas are Deer Harbour, West and East Sounds; but on the western and northern sides of Orcas there is no convenient anchorage. A vessel might drop an anchor, if necessary, southward of the *Bill of Orcas*, a remarkable projecting bare point, with a knob on its extreme.

The North coast is steep and precipitous, except between the Bill and *Thompson Point*, a distance of $2\frac{1}{2}$ miles. Immediately off this part of the coast is Parker Reef, described in page 358. From Thompson Point, a bare cliffy point, the coast forms a slight curve easterly to *Lawrence Point*, distant 6 miles. Lawrence Point, the sloping termination of the high range of Mount Constitution, is the eastern extreme of Orcas Island; on its northern side it is a steep and almost perpendicular cliff,

Deer Harbour is the westernmost of the three ports of Orcas, and, as before observed, is conveniently entered from Middle Channel by North Passage between Steep Point of Orcas and Reef Island, or between the latter and Brown Island of the Wasp group. The harbour is a mile long in a North and South direction, and about the same breadth at its southern end; it narrows, however, rapidly, and terminates in a shoal creek, and fresh-water streams fed from a lake. *Fawn Islet* lies off the steep cliffy shore of the West side of the harbour; below it the depth of water varies from 10 to 15 fathoms, abreast and above it from 5 to 8 fathoms. The bottom is mud.

West Sound may be entered from Middle Channel, either by the Wasp or Upright Passages, already described, or from Rosario Strait by either of the Obstruction Passes. Having entered by Wasp Passage, cleared Passage Rock, and being off *Broken Point*—a remarkable cliffy point, the extreme of a small peninsula on the North side of Shaw Island—West Sound will be open, extending in a N.W. $\frac{1}{2}$ N. direction for more than 2 miles, with Orcas Nob immediately over the head of it. The breadth of the sound is about three-quarters of a mile, and the depth of water from 10 to 16 fathoms, with no hidden dangers.

White Beach Bay, so named from the quantities of white clam shells, the remains of native feasts, lying on its shores, and giving them the appearance of white sandy beaches, is on the eastern side of the sound, 2 miles above Broken Point. *Massacre Bay* is the continuation of the head of the sound, between Haida and Indian Points, and the anchorage is nearly a mile above White Beach Bay. *Harbour Rock*, covering at one-third flood, lies almost in the centre of the bay, between the two entrance points.

Harney Channel, between Orcas and Shaw Islands, connects the West and East Sounds of Orcas. It commences at Broken Point, and runs in an easterly direction for 3 miles, when it enters Upright Channel between Foster and Hankin Points; the former is a low sloping green point, the southern termination of the peninsula which separates the two sounds; the latter is the eastern bluff wooded point of Shaw Island. N.W. from Hankin Point is a rocky patch which lies more than a cable off shore, and covers at half flood. *Camp Cove* is immediately northward of Foster Point; it is a convenient cove for boats, or a small vessel. *High-water Rock* lies more than a cable's length from the shore, and half a mile north-eastward from Foster Point; it is awash at high water.

Blind Bay, on Shaw Island, is on the South shore, midway between Broken and Hankin Points. A small round islet, partially wooded, lies in the centre of the entrance, and a reef of rocks, covering at high water, extends from its western point, almost choking the entrance on that side. A rock, covering at a quarter flood, also lies off the eastern side of the islet, so that the bay is only eligible for coasters, which should keep the island close aboard in entering.

East Sound.—Entering this sound by Upright Channel, or through the

Wasp Passages and Harney Channel, when abreast Upright Hill, from which *Diamond Point*, the western point of the sound, bears North 2 miles, its entrance will be easily made out. If by the Obstruction Passes, as soon as a vessel is at their western entrance, the whole length of the sound will be open, bearing N.W. $\frac{1}{2}$ W. A remarkable conical hill, over 1,000 ft. high, rises on either side of the entrance, which lies between *Diamond* and *Stockade Points*. From between these points the sound runs in a N.W. by W. direction for 6 miles; for the first 2 miles the breadth is three-quarters of a mile; it then contracts at *Cascade Bay* to half a mile, and opens out again above to more than a mile. The head of the sound terminates in two bays, a jutting cliffy point separating the two. The general depth of water in the sound is 15 fathoms.

Stockade Bay, on the eastern side of the sound entrance, nearly a mile North of *Stockade Point*, the north-western entrance point of North Obstruction Pass, affords anchorage in 8 fathoms, about 3 cables from the shore.

Green Bank, on the western side, immediately opposite *Stockade Bay*, is a bank of sand extending halfway across the sound; on it there is from 5 to 9 fathoms, with one patch of 4 fathoms. On the eastern side of the sound, 2 miles above *Stockade Bay*, is a small hook facing the S.E., forming *Cascade Bay*. A large stream falls by a cascade into the bay, and it would be a convenient place to water a ship.

HARO STRAIT.

HARO STRAIT, the westernmost of the three channels leading from the Strait of Fuca into the Strait of Georgia, is bounded on the western side by *Vancouver Island*, and its off-lying smaller islands and reefs, and on the eastern side by the islands of *San Juan* and *Stuart*, and runs in a N.W. by N. direction for 18 miles; it then turns sharply to the N.E. round *Turn Point* of *Stuart Island*, for a further distance of 12 miles, leaving *Saturna Island* to the westward, and *Waldron* and *Patos Islands* to the eastward, when it enters the Strait of Georgia between *Saturna* and *Patos Islands*. It forms the boundary between the British and United States territories.

It is for the most part a broad, and for its whole extent a deep navigable ship channel; but on account of the reefs which exist in certain parts, the general absence of steady winds, the scarcity of anchorages, and, above all, the strength and varying direction of the tides, much care and vigilance is necessary in its navigation, and it is far more adapted to steam than to sailing vessels.

Besides the main stream of the Haro Strait thus described, there are several smaller channels and passages branching from it by which vessels may enter the Strait of Georgia; thus *Swanson Channel* leads into the strait by *Active Pass* (formerly *Plumper Pass*, by which name it is more generally known),

and the Trincomalie and Stuart Channels by the Portier Pass, or Dodd Narrows.

These channels may be again entered by smaller ones; thus Sidney and Cordova Channels, on the western side of Haro Strait, lead by Moresby and Shute Passages into the Swanson and Stuart Channels, and finally into the Strait of Georgia. These channels are essentially adapted to steam navigation, or to coasting vessels; they afford smooth water, and many of them anchorages. They will be described in their proper order.

Middle Bank, lying in the southern entrance of Haro Strait, E. by N., 4 miles from Discovery Island, and almost in mid-channel, is a rocky patch about 2 miles in extent each way, and the least water found on it is 10 fathoms. In bad weather there are heavy tide rippings on and in the vicinity of this bank, which are dangerous to boats or small craft.

Zero Rock.—The principal dangers in the southern part of Haro Strait are Zero Rock and Kelp Reefs. The former lies on the West side of the strait, is about half a cable in extent, covers at three-quarters flood, and its vicinity is marked by kelp; it bears from the East point of Discovery Island N.W. $6\frac{1}{2}$ miles, and from the high white cliff of Cowitchin Head E. by S. $3\frac{1}{2}$ miles.

Kelp Reefs lie almost in the centre of Haro Strait, N.W. by N. $\frac{3}{4}$ N., $7\frac{1}{2}$ miles from the East point of Discovery Island; E. by N. $\frac{1}{4}$ N., 5 miles from Cowitchin Head; and East 2 miles from the South end of Darcy Island. They uncover at low springs, and are well marked by kelp, which extends in detached patches to Darcy Island. A *buoy* was moored on their eastern side. *Unit Rock* lies E. by N. $\frac{1}{4}$ N. three-quarters of a mile from the S.E. point of Darcy Island, and uncovers 2 ft. at low tides.

DIRECTIONS.—Vessels passing up Haro Strait to avoid the above dangers, after rounding Discovery Island at the distance of a mile, should steer N.N.W., or for Kellett Bluff of Henry Island, a remarkable steep rocky headland on the eastern side. This course will clear Kelp Reefs by over a mile. In working up, when standing westward, a vessel should tack when Low Island is shut in with the S.E. point of Sidney Island, which will give Zero Rock a good berth; but when approaching Kelp Reefs, Bare Island must be kept well open to the eastward of the same point to avoid them. The eastern or San Juan shore is steep close-to.

When abreast Kellett Bluff from half a mile to a mile, a N.W. by N. course will pass the same distance from Turn Point of Stuart Island. There are no dangers extending far off this point; but whirling eddies and tide rippings, caused by the meetings of the streams from so many channels, are generally met with, particularly with the ebb. A vessel may reach this point with a fresh southerly wind, but will almost invariably lose it here, until having opened out the middle channel eastward of San Juan.

After rounding Turn Point, a N.E. $\frac{1}{4}$ N. course for 10 miles will lead to the northern entrance of Haro Strait, between the East point of Saturna and Patos

Island. This passage is $2\frac{1}{2}$ miles in breadth, but is subject to heavy tide rippings and eddies; it is recommended when possible to pass through the centre of it. The flood from Rosario Strait, which is met with as soon as the passage between Orcas and Sucia Islands is open, is apt to set a vessel towards the East point of Saturna, off which and Tumbo Island there is much uneven and broken ground with heavy races. This point should be given a berth of a mile.

The ebb sets to the eastward even before the Strait of Georgia is well open, and a vessel finding herself not likely to weather Patos should pass between it and Sucia, where there is a good clear passage of above a mile in breadth; if this passage is taken, the Patos Island shore should be kept rather aboard. Beware of the Plumper and Clements Reefs; the former lies S.W. by S., $1\frac{1}{2}$ mile from the N.W. bluff of Sucia Island, and has 10 ft. over it; the latter N.E. $\frac{1}{4}$ N. the same distance from the same bluff, and has 9 ft. over it. When in the Strait of Georgia from W. by N. to W.N.W. is a fair mid-channel course. If bound for Fraser River, a N.W. by W. course from the centre of the channel between Patos Island and East Point will lead to the Sand Heads, the distance nearly 20 miles. Entering the strait, and having passed to the northward of Patos Island, if the ebb is running a vessel is extremely liable, unless with a commanding breeze, to be set to the eastward and down Rosario Channel.

The northern shore of Sucia Island should by all means be avoided. If Alden Bank can be fetched, it offers a good anchorage while waiting for a tide.

Cormorant Bay, between Gordon and Cowitchin Heads, on the western side of Haro Strait, is a good stopping place, and easy of access under most circumstances. Fresh water may be obtained on its southern shore. It may be entered either to the southward or northward of Zero Rock; the passage to the southward is $1\frac{1}{2}$ mile in breadth, with a depth of 20 fathoms. *Mount Douglas*, a remarkable hill, 696 ft. high, with its summit bare of trees, rises immediately over the coast at the head of the bay. *Johnstone Reef* lies three-quarters of a mile from the shore, midway between Cadboro Point and Gordon Head, is marked by kelp, and of small extent. Three shoal patches, with from 6 to 12 ft. on them, lie W. $\frac{1}{4}$ S., 1 to $1\frac{1}{2}$ mile distant from Zero Rock. There is but little stream of tide in Cormorant Bay when within Zero Rock, and the holding ground is good.

Although there are many harbours among the archipelago of islands which form Haro Strait and its tributary channels, yet the number eligible for sailing vessels overtaken by darkness or an adverse tide is comparatively small.

Between Cormorant Bay and the northern entrance of Haro Strait, Plumper Sound and Cowlitz Bay are the only eligible stopping places for a sailing vessel seeking shelter.

Stuart Island, indeed, affords two fair harbours, and Roche Harbour, at the N.W. end of San Juan Island is a suitable anchorage for steamers or small

coasters, but no sailing vessel of moderate tonnage could enter either, under ordinary circumstances, without great loss of time as well as risk.

Tides.—The stream of tide runs fairly through the main channel of Haro Strait, outside Kelp Reefs, and inside them through the Cordova and Sidney Channels; passing outside Kelp Reefs, and eastward of Sidney Island, a part of the flood stream will be found to branch off to the eastward, between San Juan and Stuart Islands, and there meeting the flood from Middle Channel, cause heavy races and eddies, so that although there are deep-water channels between these islands, they are not recommended for sailing vessels; in like manner the flood runs to the N.W. between the group of islands northward of Sidney Island, and through Shute and Moresby Passages, though the main stream will be found to run fairly between Stuart and Moresby Islands.

PLUMPER SOUND.—If from any cause it should be found necessary to anchor in that bend of Haro Strait between Stuart Island and the East point of Saturna Island, this sound is recommended as a safe and convenient harbour, easy of access with the wind from any quarter. It is formed between Pender and Saturna Islands, and the entrance lies N.E. by N. $\frac{1}{2}$ N., 5 miles from Turn Point of Stuart Island, and an equal distance from the East point of Saturna. *Blunden Island*, about 2 cables in length, and close to the shore, forms the western entrance point; *Monarch Head*, a high, bold, rocky headland, the eastern. The sound runs in a W.N.W. direction for 6 miles, with an average breadth of $1\frac{1}{2}$ mile. There is anchorage in a moderate depth of water in most parts of it, as well as several bays or harbours if preferred.

There are no dangers at the entrance; either shore may be approached close, in working up, and but little tide is felt.

Excellent anchorage may be had in almost any part; the most convenient is off the entrance of Browning Harbour, on the South side of the sound, in 8 fathoms. Above Browning Harbour, the only danger to be avoided in working up the sound is *Perry Rock*, with 6 ft. on it, marked by kelp; it is 2 cables from the shore and N.W. by N., three-quarters of a mile from Razor Point, the North point of the harbour.

Browning Harbour is on the South side of Plumper Sound, 3 miles within the entrance; it runs in a West direction for $1\frac{1}{2}$ mile, and is a third of a mile wide, but rather less at the entrance. The depth of water decreases gradually from 10 fathoms at the entrance to 4 fathoms at its head, with good holding ground.

Lyll Harbour and Winter Cove lie in the S.E. corner of Plumper Sound, and are indentations in the N.W. end of Saturna Island.

Lyll Harbour is the southernmost, and its southern entrance point, a cliffy bluff, bears N. $\frac{1}{2}$ E., 2 miles from the entrance of Browning Harbour. The harbour runs East for $1\frac{1}{2}$ mile, gradually narrowing and terminating in a sandy beach with a good stream of fresh water at its head; but *Crispin Rock*, with

6 ft. on it at low water, decreases its value as a harbour for sailing vessels. This rock is a mere pinnacle, nearly half a mile within the entrance; there is no kelp to give warning of its position, and it lies exactly in the middle of the harbour. *Boat Cove*, on the South side of the harbour, a third of a mile within the South point, has 3 fathoms water, and is a convenient spot for repairing a vessel. A small islet lies off its western entrance point.

Samuel Island, between Saturna and Mayne Islands, is almost connected with either, but leaving two passages by which boats or even small coasters may pass into the Strait of Georgia at proper times of tide. This island is indented on its southern side by several bays, among them *Winter Cove*, which is formed between its south-eastern side and the N.W. point of Saturna, and is only half a mile northward of Lyall Harbour. The depth of water in the cove being only from 2 to 3 fathoms, it is only fit for small vessels, which must pass to the westward of King Islets, and on either side of Minx Reef.

NAVY CHANNEL is a continuation of the western part of Plumper Sound, and leads between Pender and Mayne Islands into Trincomalie Channel. Independently, therefore, of its value as an anchorage, Plumper Sound becomes a highroad for vessels bound into the Strait of Georgia or Fraser River by Active Pass, or to Nanaimo, or any of the north-western ports of Vancouver Island. From the north-western end of the sound abreast Fano Island the channel runs West for 3 miles, when it enters Trincomalie Channel between Mayne and Prevost Islands; its average breadth is half a mile.

Conconi Reef lies about midway through Navy Channel, $1\frac{1}{2}$ mile from Fano Island, and nearly 2 cables off the northern shore, and narrows the strait at that part to a third of a mile. It is a ledge of rocks extending in the direction of the channel for more than a cable's length, and covering at half tide; its vicinity is marked by kelp.

Enterprise Reefs are two rocky patches, the westernmost of which dries at low water, and both are marked by kelp. The outermost of these reefs lies W.N.W. 1 mile from *Dinner Point*, the N.W. entrance point of Navy Channel, and S. by E. two-thirds of a mile from *Helen Point*, the South point of Active Pass. Vessels using Navy Channel should keep rather southward of mid-channel. The shores of Pender Island are bold.

Bedwell Harbour, on the S.E. part of Pender Island, the entrance to which bears North 3 miles from Turn Point of Stuart Island, and is the same distance westward of the southern entrance of Plumper Sound, is, on account of its narrower entrance, not so eligible a stopping-place for vessels waiting the tide as the latter; but for steamers it is a good harbour. Its narrowest part, which is at the entrance, is a quarter of a mile in breadth, but it soon opens out to half a mile, and runs in a W.N.W. direction for 2 miles, the depth of water being from 5 to 10 fathoms, mud bottom. The only danger which does not show is *Drew Rock*, with 10 ft. on it, in the centre of the harbour, and a third of a mile from its head. *Camp Bay*, between Bedwell

Harbour and Plumper Sound, and half a mile westward of Blunden Island, offers shelter as a stopping-place to small craft, when not convenient to work into either of these ports.

STUART ISLAND, lying 3 miles north-westward of the northern part of the island of San Juan, is 3 miles long in an East and West direction, of an irregular shape, and about 650 ft. high, the summits of the hills partially bare of trees. *Turn Point*, its N.W. extreme, a bold cliffy bluff, forms the salient angle of Haro Strait, where it changes its direction suddenly from N.W. by N. to N.E., before entering the Strait of Georgia. There are two anchorages in Stuart Island, *Reid Harbour* on its southern side, and *Prevost Harbour* on its northern, but both are small and intricate for sailing vessels above the size of coasters.

Johns Island, with its numerous off-lying reefs, lies to the eastward of Stuart Island, and separated from it by a navigable channel of 10 fathoms, but it is narrow, and only recommended for coasters acquainted with the locality.

Spieden Island, lying between San Juan and Stuart Islands, is 2 miles long in an East and West direction, and very narrow; its southern side grassy and bare of trees, its summit and northern side thickly wooded. *Green Point*, its eastern extreme, is a sloping grassy point. There is a channel on either side of Spieden Island; *New Channel* to the northward, and *Spieden Channel* to the southward.

Spieden Channel, between the island of that name and San Juan, has a general W. by S. direction. Its eastern entrance, between *Green Point* and the N.E. point of San Juan, is two-thirds of a mile wide, and for 2 miles the water is deep and clear of positive dangers; the meeting of the flood-tide, however, from Haro Strait with that from *Middle Channel*, causes heavy rippings and irregular eddies, and these, together with the general absence of steady winds, render the navigation always tedious and dangerous for sailing vessels; its western entrance is encumbered with numerous reefs and shoals with irregular soundings.

Sentinel Island stands in the western entrance of this channel. It is small, bare on its southern side, about 150 ft. high, and bears E.S.E. two-thirds of a mile from Spieden Bluff. *Centre Reef* is a dangerous patch, awash at low water, and almost in the centre of the channel. It bears from *Sentinel Island* S.W. by S. nearly half a mile; from Spieden Bluff, the western extreme of that island, S.E. by S. more than two-thirds of a mile; and from *Morse Island*, off the North point of *Henry Island*, N.E. by N. $\frac{1}{2}$ N., 1 mile; the kelp will generally be seen round the reef, but it is sometimes run under. *Danger Shoal* is also at the western entrance; it has 2 fathoms on it, and is marked by kelp, though not always to be distinguished. It bears from Spieden Bluff S.W. by S. $\frac{1}{4}$ S. three-quarters of a mile. *Bare Islet* is a rock, about 15 ft. high, lying in the southern part of the channel, E. by N. $\frac{1}{2}$ N.

North Pacific.

1 mile from Morse Island. There is a shoal patch of 15 ft. nearly 2 cables N.W. by N. from it.

Directions.—Vessels bound from Haro Strait to the eastward through Spieden Channel should pass about a quarter of a mile or less northward of Morse Island, and then steer for Green Point, the East extreme of Spieden Island, until Sentinel Island bears N.W.; the dangers will then be passed, and a straight course may be steered through.

If bound westward through this channel, if the passage between Spieden and Sentinel Islands is not taken, the shore of Spieden Island should still be kept aboard within a quarter of a mile to avoid the tide races.

New Channel to the northward of Spieden Island, though narrower than the one just described, is deep, more free from danger, and the navigation of it more simple. The northern shore of Spieden Island is bold and steep, and should be kept aboard; the narrowest part of the channel is a quarter of a mile wide between Spieden and the Cactus Islands.

SAN JUAN ISLAND, the western coast of which forms for some distance the eastern boundary of Haro Strait, is of considerable size, being 13 miles in length in a N.W. and S.E. direction, with an average breadth of about 4 miles.* Its western shores are steep and rocky, and afford no anchorage, soundings from 100 to 150 fathoms being found within half a mile of the coast. *Mount Dallas* rises abruptly to a height of 1,086 ft., but the eastern side of the island falls in a more gentle slope, and affords a considerable extent of good land available for agricultural or grazing purposes. Towards the southern end, and visible from seaward, were some buildings, once a farming establishment of the Hudson Bay Company, but now abandoned; † the south-eastern extreme, which forms one of the entrance points of the Middle

* Lord Milton's excellent work on the political importance of San Juan, and the discussion which it gave rise to, has been before alluded to.

† Capt. R. C. Mayne, R.N., in his interesting book, "Four Years in British Columbia and Vancouver Island" (employed on the survey), thus speaks of San Juan Island. There is more land available for agriculture here than on any other of the group; and of this the Hudson Bay Company took advantage some years ago, and established a sheep-farm upon it. It is situated on a beautiful prairie at the S.E. end of the island, which, rising 140 ft. above the water, looks most attractive to the emigrant passing onward toward the Fraser. I have never seen wild flowers elsewhere grow with the beauty and luxuriance they possess here. Perhaps I cannot illustrate the attractions of San Juan better, than by saying that it was the spot selected by his Excellency the Governor's daughter and niece in which to spend their honeymoons.

At one time I believe the Company had as many as 3,000 sheep on the island, distributed at various stations, all under Mr. Griffith's charge. His house, which is very pleasantly situated, looks out on the Strait of Fuca, and commands a magnificent view up Admiralty Inlet. Directly in front of it lies a bank, which is a very favourite fishing-station of the Indians, where they catch a large number of salmon and halibut.

Channel, terminates in a white clay cliff, over which rises Mount Finlayson to a height of 550 feet.

Henry Island.—Off the N.W. end of San Juan lies Henry Island, being only separated from it by a narrow channel called Mosquito Passage. Henry Island would be taken as a part of San Juan, the passage appearing merely as an indentation. *Kellett Bluff*, the S.W. point of the island, makes as the most prominent headland on the eastern side of Haro Strait, when seen from the southward. Immediately eastward of it is *Open Bay*, which has more the appearance of a channel than the true one, Mosquito Passage. There is not either shelter in the bay, or anchorage in the passage, for anything beyond coasters.

Mosquito Passage runs in a northerly and N.N.W. direction for 3 miles, is something over half a mile in breadth, and is studded with numerous reefs, which are marked by kelp. When a mile within the passage, *Westcott Creek*, an indentation in San Juan, branches off to the N.E., and affords a haven for coasters. At the northern entrance of Mosquito Passage, the space between San Juan and Henry Islands opens out considerably, and the depth of water increases. This space forms *Roche Harbour*, which must be entered from the northward by vessels of burden; its entrance is somewhat confined but not uneasy of access, and it affords good shelter when within. *Morse Island*, a small flat cliffy island, about 30 ft. high, lies a quarter of a mile westward of the North point of Henry Island; and the entrance of Roche Harbour is half a mile eastward of the former. Small vessels leaving Roche Harbour, and bound southward, may take the Mosquito Passage.

WALDRON ISLAND lies in the northern entrance of the Middle Channel, and its anchorages are frequently available for vessels passing to or from Haro Strait. The island is thickly wooded, moderately high, and cliffy on its southern and eastern sides, but falling to the northward, where it terminates in low sandy points. *Disney Point*, its southern extreme, is a remarkable high stratified bluff.

Cowlitz Bay, on the western side of Waldron, between Disney and Sandy Points, affords good anchorage with all winds, the depth of water from 5 to 8 fathoms, and the holding ground stiff mud; it may be sometimes more desirable to anchor here than to work 2 or 3 miles up into Plumper Sound, particularly for vessels coming up Middle Channel.

North Bay, on the N.W. side of the island, affords anchorage in 8 to 10 fathoms about a quarter of a mile off shore, but it is not by any means so desirable a place as Cowlitz Bay.

Danger Rock.—This dangerous reef, mentioned on page 357, with only 5 ft. on it, and on which the kelp is rarely seen, lies S.E. by E. $\frac{1}{4}$ E., a little over a quarter of a mile from *White Rock*, which is 25 ft. above high water, and has also a covering rock extending 2 cables to the N.W. of it.

The **WESTERN CHANNELS** of **HARO STRAIT** may be used with advantage by steamers or coasters bound from the southern ports of Vancouver Island to the Strait of Georgia, or to the districts of Saanich, Cowitchin, Nanaimo, and the numerous intermediate harbours; their advantages over Haro Strait consist in a less strength of tide, with sheltered anchorage in almost all parts, while in the latter strait the depth of water is so great that it is impossible to anchor, and sailing vessels may frequently be set back into Fucu Strait, thus entailing great delay as well as risk. On the other hand, the western channels are not free from danger, yet, with the assistance of the chart and a good look-out from aloft for kelp, they may be navigated during daylight with ease and safety.

Sidney Channel.—Having passed either inside or outside Zero Rock, and intending to take Sidney Channel, between Sidney and James Islands, which is the best, the following directions should be observed.

The southern face of *James Island* is a moderately high and steep white clay cliff, its summit covered with trees; towards the eastern part of this cliff are two remarkable notches on its summit. Steer to the N.N.W. to bring Mount Tuam (on the southern point of Admiral Island) over the centre between these two notches, bearing N.W. by W., and this mark will lead westward of the 3-fathoms patch off Darcy Island, and between it and the shoal of 9 ft. extending south-eastward of James Island.

The breadth of the channel is nearly a mile, with from 14 to 20 fathoms, until near its northern end, where a patch with 3 fathoms, marked by kelp, lies 3 cables' lengths off the western point of Sidney Island; this is avoided by not shutting in the passage between Darcy and Sidney Islands, until the N.W. end of Sidney Spit, a long sandy tongue with a few trees on its extreme, bears North. There is good anchorage off this spit in 8 fathoms.

Cordova Channel, westward of James Island, between it and the main Island of Vancouver, is a fair passage with anchorage along the shore of the main island and little tide. It is not, however, to be preferred to the Sidney Channel, as a sand-bank, with 15 ft. on it, lies in the centre of the southern entrance.

Miners Channel.—*Low and Bare Islands* are two small islands lying off the eastern side of Sidney Island, and between them and the latter there is a good passage, three-quarters of a mile in breadth, with 10 fathoms least water. This channel may often prove convenient for vessels having passed up Haro Strait eastward of Kelp Reefs, and desiring to take the inner channels to Saanich, Cowitchin, or through Stuart Channel. Midway between Low and Bare Islands, and on the line between their N.W. points, is a reef which uncovers. A 3-fathoms shoal lies on each side of the southern entrance of the channel.

Having passed to the northward of Sidney Island, either by Cordova, Sidney, or Miners Channels, the Shute or Moresby Passages may be taken as convenient.

Shute Passage.—To enter this passage, after leaving Sidney Spit, pass between Jones Island and the Little Group, then eastward of Coal Island, Knapp and Pym Islands, and between Piers and Portland Islands, when Satellite Channel will be entered, which leads directly to Saanich, Cowitchin, and the western ports of Vancouver Island. This is a good, clear channel, and with the assistance of the chart may be used with much facility.

Jones Island lies North from Sidney Spit two-thirds of a mile, with a clear passage between. The *Little Group* lie W. by N. two-thirds of a mile from Jones Island. They consist of four rocky islets, bare of trees, and connected by reefs. *Bird Islet*, lying on the eastern side of Shute Passage, and N.N.W. two-thirds of a mile from the North point of Jones Island, is about 6 ft. above high water.

Coal Island, which helps to form the western side of Shute Passage, lies close off the N.E. extreme of Saanich Peninsula, and immediately at the entrance of Shoal Harbour. It is a mile in extent, and thickly wooded, and its eastern and northern shores are free from danger.

A rock, which covers at quarter flood, lies W.N.W. 4 cables from the East end of the group, and S.S.E. nearly two-thirds of a mile from the East point of the island. A small patch, with 4 fathoms over it, and marked by kelp, lies N.E. 1 mile from the East point of Coal Island, N.W. by N. $\frac{1}{2}$ N. more than three-quarters of a mile from Bird Islet, and one-third of a mile S.W. from Yellow Islet.

Celia Reef must also be avoided. The least water found on it is 9 ft.; it is marked by kelp, and lies North two-thirds of a mile from the North point of Pym Island. *Knapp and Pym Islands* are small and wooded, lying between Piers and Coal Islands. Having passed westward between these islands, a vessel is fairly in Satellite Channel.

Moresby Passage.—After leaving the northern end of Sidney Island, the directions for Moresby Passage are the same as those already given for Shute Passage, until abreast the East point of Coal Island. From a berth about one-third of a mile off this point, the direct course through the passage is N. by W. for 2 miles, or until near its northern entrance, which lies between Portland and Moresby Islands. This space is wide, and free from danger; it then becomes somewhat intricate, from Turnbull Reef and Canoe Rocks, which extend off both these islands, narrowing the channel at its northern entrance to little over one-third of a mile.

Off the eastern point of Portland Island are three rocky islets, the *Sisters*, which extend to a distance of nearly 2 cables. They are about 25 ft. high, have a few stunted cedar trees on their summits, are joined by reefs, and will be immediately recognised either from the northward or southward. Eastward from the Sisters, at a distance of more than one-third of a mile, extends *Turnbull Reef*, with 2 fathoms least water on its outer edge, and marked by a heavy bank of kelp. *Canoe Rocks* are a dangerous ledge, extending W. $\frac{1}{2}$ N., nearly

half a mile from Reef Point, the N.W. point of Moresby Island; the outer rock of this ledge covers a little after half flood, and is not marked by kelp, though kelp grows between the point and the rock. When both or either of these dangers are visible, the passage is very easy.

Prevost Passage lies between Moresby Island and the group of smaller islands to the southward of it, and leads by the Shute or Moresby Passages into Satellite Channel. To a vessel passing up the main stream of Haro Strait, and bound for Swanson Channel, the easiest and most direct route is between Stuart and Moresby Islands; but circumstances of wind or tide may render it convenient to take Prevost Passage.

The dangers to be avoided in Prevost Passage are the Arachne and Cooper Reefs. *Arachne Reef* lies nearly in the centre of the passage, in a direct line between Fairfax Point, the S.E. point of Moresby Island, and Tom Point, the East point of Gooch Island. This reef covers at quarter flood, and has a good deal of kelp on its N.W. edge, which, however, is frequently hidden by the tide.

Cooper Reef, lying half a mile N. by W. of Tom Point of Gooch Island, is marked by kelp, and uncovers at half ebb.

Yellow Island, a small bare island S.W. by W. nearly 1 mile from Fairfax Point, may be passed on either side. The North side is recommended; if passing on its South side, take care to avoid the small patch of 4 fathoms, marked by kelp, mentioned in page 373 as lying S.W., a third of a mile from it.

SATELLITE CHANNEL is formed by Admiral Island on the North, and Moresby, Portland, and Piers Islands, and the northern shore of Saanitch Peninsula on the South. It leads to Saanich Inlet, Cowitchin Harbour, and by Sansum Narrows to Stuart Channel. It is a fair deep passage, with but few dangers, which are not always visible; among these are Shute Reef and Patey Rock.

Shute Reef is a ledge less than half a cable in extent, with two rocks, one of which dries 8 ft. at low water, its vicinity being marked by kelp. It lies W.S.W. two-thirds of a mile from Harry Point, the North point of Piers Island, and N. $\frac{1}{2}$ E. nearly 3 cables from Arbutus, a small islet lying half a mile westward of Piers Island.

Patey Rock, at the western end of Satellite Channel, is a single rock, uncovering at half tide, with kelp round it, and is in the way of vessels working into Saanich Inlet or Cowitchin Harbour. It bears from Hatch Point, the westernmost point of Saanich Inlet, N.E. by N., two-thirds of a mile, from *Coal Point*, a remarkable nob point, the South extreme of Deep Cove, N.W. by W. $\frac{1}{2}$ W. nearly 2 miles, and from Arbutus Island S.W. by W. $\frac{1}{2}$ W., 3 $\frac{1}{2}$ miles.

Cecil Rock, lying S.E. $\frac{1}{2}$ S. a quarter of a mile from the S.W. point of Russell Island at the entrance of Fulford Harbour, must also be avoided in

working up Satellite Channel. *Boatswain Bank*, on the western side of the channel, affords good anchorage in from 4 to 9 fathoms, sandy bottom. It extends three-quarters of a mile from the Vancouver shore, between Cherry and Hatch Points.

SAANICH INLET is a deep indentation running in a nearly S.S.E. direction for 14 miles, carrying deep water to its head, which terminates in a narrow creek within 4 miles of Esquimalt Harbour. The inlet forms a peninsula of the S.E. portion of Vancouver Island, about 20 miles long in a N.N.W. and S.S.E. direction, and varying in breadth from 8 miles at its southern part to 3 miles at its northern.

On the southern coast of this peninsula are the harbours of Esquimalt and Victoria, in the neighbourhood of which, for some 5 miles, the country is pretty thickly wooded, its prevailing features lake and mountain, with, however, some considerable tracts of clear and fertile land; the northern portion for about 10 miles contains some of the best agricultural land in Vancouver Island. The coast line is fringed with pine forests, but in the centre it is clear prairie or oak land, and much of it under cultivation; seams of coal have also been found.

Off the eastern or peninsula side of the inlet there are some good anchorages, the centre being for the most part deep. Immediately southward of James Point, the north-western point of the peninsula, is Deep Cove, but no convenient anchorage.

Norris Rock, awash at half tide, lies S.W. by S. 2 cables from James Point, with 12 fathoms between it and the point. Vessels rounding this point should give it a berth of half a mile.

COWITCHIN HARBOUR is 4 miles westward of *Cape Keppel*, the southern extreme of Admiral Island; *Separation Point*, the western point of entrance of Sansum Narrows, forms its northern entrance point, and is somewhat remarkable, being the termination of a high stony ridge dropping suddenly, and running off as a low sharp point to the southward. Cowitchin runs to the westward of this point for $2\frac{1}{2}$ miles, and the general depth of water in it is 30 fathoms, which shoals suddenly as the flat, which dries off for more than half a mile from the head of the harbour, is approached. But for the large tract of good land contained in the valley of Cowitchin, the port would scarcely be deserving of notice, and certainly the term of bay is more applicable to it than that of harbour. The only convenient anchorage to be obtained is in *Snug Creek*, on the North side of the harbour, or off the outer village on the South side, a mile within the entrance.

Sansum Narrows run in a general northerly direction between Vancouver and Admiral Islands for a distance of 6 miles, when they lead into Stuart Channel. Their average breadth is about half a mile, but at their narrowest part, abreast Bold Bluff on the Admiral Island shore, $2\frac{1}{2}$ miles above Separation Point, they are contracted to a third of a mile. The high land on either side

renders the wind generally very unsteady; it cannot be recommended except for steamers or coasting vessels.

Entering Sansum Narrows from the southward, a kelp patch, with 9 ft. on it, must be avoided on the Admiral Island shore. It lies 2 cables S.S.W. from a small islet close to the coast, nearly a mile E. by N. from Separation Point, and S.E. $\frac{1}{2}$ S. half a mile from Entrance Point.

Another rocky patch extends nearly a cable off shore from the eastern side of the Narrows, three-quarters of a mile north-westward of Entrance Point. *Burial Islet*, a small spot used as an Indian burying-place, lies on the eastern side of the Narrows, $1\frac{1}{2}$ mile above Separation Point.

Burgoyne Bay.—*Bold Bluff*, a smooth headland of bare rock, is steep-to; the channel here is scarcely a third of a mile across. Burgoyne Bay, the entrance to which is half a mile eastward of Bold Bluff, is a narrow and rather deep indentation in Admiral Island, terminating in a sandy head. There is no bottom in the bay under 30 fathoms, until within 2 cables of its head, when the water shoals suddenly from 10 to 4 fathoms. Anchorage may be had if necessary.

Maple Bay.—From Grave Point the Narrows take a north-westerly direction, and at a distance of little more than a mile on the Vancouver Island shore is Maple Bay. *Boulder*, the southern entrance point, is remarkable from a large boulder stone standing at its low water extreme. Although an inviting looking bay, the water is too deep for comfortable anchorage. *Bird's-eye Cove*, which runs in a southerly direction for nearly a mile from Boulder Point, affords fair anchorage in 8 to 10 fathoms. A shoal patch, with 2 fathoms, extends nearly a cable off the West side of the cove.

STUART CHANNEL.—Sansum Narrows extend $1\frac{1}{2}$ mile northward of Maple Bay, when they lead into Stuart Channel, the westernmost of the ship passages which wash the eastern side of Vancouver Island. The western side of this channel is formed by the shores of that island; its eastern by the coasts of Admiral and Thetis Islands. It runs in a general N.W. direction for nearly 20 miles, when it joins Dodd Narrows below Nanaimo. The principal dangers are North and Escape Reefs, White Rock, and Danger Reef.

On the western or Vancouver Island shore there are some good harbours, viz., Osborn Bay, Horse-shoe Bay, Oyster Harbour, and Chemainos Bay; on the eastern side there are also some anchorages, Telegraph and Preedy Harbours on the western, and Clam Bay on the eastern side of Thetis Island.

Osborn Bay, the southernmost anchorage on the western side of Stuart Channel, may be known by Shoal Islands, a low wooded group, connected at low water by reefs and mud-banks, and which form the northern side of the bay. The bay affords good anchorage, sheltered from the prevailing winds, from the westward and S.E.

The coast north-westward of Osborn Bay, between it and Horse-shoe Bay, is

shoal for some distance off, deepening suddenly when half a mile from the shore, and vessels should by no means approach it within that distance.

Horse-Shoe Bay, 4 miles north-westward of Osborn Bay, will be known by a rather remarkable sharp point (*Bare Point*), bare at its extreme, which forms its eastern entrance. There is convenient anchorage for small vessels within a quarter of a mile of its head. *Bird Reef*, a rocky ledge uncovering at half tide, extends a cable's length from the shore, north-westward of the western point of entrance, and bears from Bare Point W. by S. half a mile.

Oyster Harbour is 4 miles W.N.W. from Horse-shoe Bay, the intervening coast being free from danger; the harbour runs in the same direction for 4 miles, is nearly a mile wide at the entrance, narrowing gradually within. Entering from the northward, Coffin Islet should be given a berth of 2 cables; there are no other dangers which are not visible. At low water the oyster beds dry for 2 cables off the South shore. A good anchorage for a large vessel is a mile within the entrance.

It is high water in Oyster Harbour, on full and change, at 6^h 30^m p.m., and the rise is 10 ft.

Chemainos Bay is 2½ miles northward of the entrance of Oyster Harbour, and W. by S. the same distance from Reef Point, the N.W. point of Thetis Island. It is open, and cannot be recommended. *Yellow Point*, bare and grassy at its extreme, is the North point of Chemainos Bay. From thence to Round Island, at the southern entrance of Dodd Narrows, and bearing N.W. 5 miles, the coast is bold, and free from danger.

From the northern entrance of Sansum Narrows to North Reef, a distance of 4 miles, there are no dangers, and both shores may be approached boldly in working up.

North Reef is a sandstone ledge, running in a north-westerly and south-easterly direction, as all the reefs in this channel do. It bears from the S.E. point of Tent Island S. ½ E. half a mile, with a clear channel between of 26 fathoms. Its summit is just awash at high water, and therefore easily avoided.

Tent Island, narrow and two-thirds of a mile long, lies off the South extreme of Kuper Island, and a cable's length off its S.E. end are two remarkable worn sandstone rocks, 8 or 10 ft. above water; the breadth of the passage between them and North Reef is one-third of a mile. Nearly 2 cables N.E. ½ E. from the S.E. end of Tent, is a rock which uncovers 2 ft.

Escape Reef, at 2 miles N.W. by W. ½ W. from North Reef, is a dangerous patch, nearly one-third of a mile in extent, in a W.N.W. and E.S.E. direction, which covers at quarter flood, and has no kelp to mark its position. It lies nearly half a mile from the West shore of Kuper Island; there is a deep channel a third of a mile wide between it and Kuper Island.

Alarm Rock is scarcely in the track of vessels working up Stuart Channel.

North Pacific.

It lies nearly 2 cables S. by W. from the S.E. point of Hudson Island, the southeasternmost of the group of islands which lie off the western sides of Kuper and Thetis Islands. It just covers at high water. *False Rock* lies N.W. by W. $\frac{1}{2}$ W. 4 cables from Scott Island, the north-western of the group just mentioned, and covers at half flood.

White Rock, about 30 yards long, and 15 ft. above high water, lies N.N.W. 1 mile from Reef Point, the N.W. extreme of Thetis Island. This rock has a whitish appearance, and is readily distinguished from a vessel's deck at 2 or 3 miles. It may be passed within 2 cables' lengths.

Ragged Island, a low rocky islet, with a few trees on it, lies a third of a mile northward of the North end of Thetis Island, with a passage of 12 fathoms between them.

DANGER REEF covers a space of 3 cables almost in the centre of the channel. A small portion of it is generally awash at high water, at which time it is difficult to make out until within a short distance of it. White Rock bears from it S.E. by S., distant 1 mile; and Tree Islet N.E. $\frac{1}{2}$ N., two-thirds of a mile.

In passing through Stuart Channel, there is a clear passage of $1\frac{1}{4}$ mile between Danger Reef and the Vancouver Island shore, and going either up or down the channel, White Rock kept on with the low neck (a gap between the two summits of Thetis Island) leads well to the westward of the reef. There is a clear passage of three-quarters of a mile between White Rock and Danger Reef, and of more than half a mile between the reef and Tree Island, with a depth of over 30 fathoms.

Vesuvius Bay, on the western side of Admiral Island, immediately opposite Osborn Bay, has deep water, but shoals suddenly at its head. It is not recommended as an anchorage. There is also anchorage inside *Idol Islet* in Houston Passage.

Grappler Reef, on the eastern side of Houston Passage, is a cable in extent, and uncovers at very low water. It lies a quarter of a mile off the N.W. end of Admiral Island, with Southey Point bearing N.N.E. half a mile; there is 5 fathoms between it and the shore of the island.

TELEGRAPH HARBOUR, on the West side of Kuper Island, is a snug anchorage, and its entrance is between Hudson Island and Active Point, which are half a mile apart. Entering from the southward, Escape Reef must be avoided. If passing inside the reef, the shore of the island should be kept aboard within a quarter of a mile: if outside, or westward, then the Sandstone Rocks should be kept open of the S.E. point of Tent Island, until Upright Cliff of Kuper Island bears N.E., when a vessel will be well to the northward of it, and may steer for the entrance of the harbour, which is free from danger, with the exception of *Alarm Reef*, extending from the S.E. point of Hudson Island.

Preedy Harbour is separated from the one just described by a group of

small islands and reefs; its entrance is to the northward of them, between Scott Island and Crescent Point of Thetis Island, and is a third of a mile in breadth; in entering, the Thetis Island shore should be kept aboard to avoid *False Rock*, a patch which covers at half tide, nearly 4 cables W.N.W. from the West end of Scott Island, and S.W. $\frac{1}{2}$ S. half a mile from Crescent Point.

SWANSON CHANNEL leads from Haro Strait to the north-westward between Admiral Island on the West and Pender Island on the East. Passing eastward of Prevost Island, it enters Active Pass between Galiano and Mayne Islands, thence into the Strait of Georgia; northward of Active Pass it connects with Trincomalie Channel.

ADMIRAL ISLAND, separating the Stuart from the Trincomalie and Swanson Channels, is of considerable extent, being nearly 15 miles in length N.W. and S.E., and varying in breadth from 2 miles at its northern end to 6 miles at its southern end. It has two good ports, Fulford Harbour on its S.E., and Ganges Harbour on its eastern side. The southern portion of the island (which is a peninsula formed by the indentations of Fulford Harbour and Burgoyne Bay, a valley separating the heads of these ports) is composed of a lofty ridge of mountains, over 2,000 ft. in height, rising abruptly from all sides.

Immediately northward of the valley, and over Burgoyne Bay on its western side, *Mount Baynes* rises to an elevation of nearly 2,000 ft., and is very remarkable; its southern face being a perpendicular precipice, visible a long distance from the southward or eastward. The *Otter Range*, of somewhat less elevation, rises northward of Mount Baynes, from whence the island slopes away in a wedge shape, its northern termination, Southey Point, being a sharp extreme. The island is for the most part thickly wooded. Near its northern end is the *Saltspring* settlement.

Fulford Harbour penetrates the S.E. side of Admiralty Island in a W.N.W. direction for $2\frac{1}{2}$ miles. At its entrance is Russell Island, between which and Isabella Point, the western point of the harbour, is the best passage in. *Cecil Rock*, with 2 fathoms on it, lies S.E. $\frac{1}{2}$ S. a quarter of a mile from the S.W. point of the island. The breadth of the southern entrance is two-thirds of a mile, with a depth of 20 fathoms until abreast North Rock, which is a small rocky islet lying close off the North point of the harbour; a rock, which covers at quarter flood, lies 2 cables West of it, and more than $1\frac{1}{2}$ cable from the shore, so that strangers entering should keep rather to the southward of mid-channel until past it. Mount Baynes appears very remarkable from the harbour, rising immediately over its head almost as a perpendicular cliff. The northern passage into the harbour between Russell Island and Eleanor Point, though in places not more than one-third of a mile in breadth, is a safe channel of 14 to 18 fathoms water. *Louisa Rock*, with but 1 fathom on it, is the only danger; it lies 2 cables from the northern or Admiral Island shore.

GANGES HARBOUR is a safe and commodious port for vessels of any description or size. Its southern entrance, which is in Swanson Channel, lies

between Admiral and Prevost Islands, and has no dangers which are not visible. In entering, *Channel Islets* may be passed on either side; they are two small wooded islands, $1\frac{1}{2}$ mile within Beaver Point, and 2 cables from the shore of Admiral Island.

Liddell Point, the S.W. extreme of Prevost Island, and the northern entrance point of the harbour, has an uncovering reef extending $1\frac{1}{2}$ cable eastward of it. *Acland Islands*, two in number, lie to the westward of the point along the shore of Prevost Island, between which and them there is no ship channel. The fair channel into the harbour is between the Channel and Acland Islands, the breadth between them is half a mile, the depth 30 fathoms; having passed these islands the harbour is nearly $1\frac{1}{2}$ mile wide, and the general depth for 2 miles, 20 fathoms.

There are but few dangers in working into the harbour, and they are easily avoided. A rocky patch with 1 fathom on it lies W. $\frac{1}{4}$ N. 2 cables from the West point of the westernmost Acland Island, and nearly the same distance off shore. The 1-fathom patch is more in the track of vessels; it lies with the southernmost Channel Islet bearing E. by S. $\frac{1}{2}$ S. nearly 2 miles, and Peile Point, the N.W. extreme of Prevost Island, North 2 miles, and is half a mile from the southern or Admiral Island side of the harbour; there is a clear passage of half a mile southward of the patch in 14 fathoms. To the northward of it the passage is a mile wide.

A vessel may anchor as soon as 10 or 12 fathoms is found. *Chain Islands* are a group of six or seven low narrow islets connected by reefs, extending from the head of the harbour in an E.S.E. direction for $1\frac{1}{2}$ mile. To the southward of these islands the ground is clear, but to the northward of them are scattered reefs, and a vessel is not recommended to anchor on that side within the outermost island.

Captain Passage also leads into Ganges Harbour, to the northward of Prevost Island. It is a clear deep passage, nearly half a mile wide, with depths from 30 to 40 fathoms, and vessels from the northward intending to enter should always use it. There is only one danger, which is well inside Ganges Harbour, and is almost equally in the track of vessels working up by the southern passage; it is a small patch of 2 fathoms lying $3\frac{1}{2}$ cables S.W. by W. from the western entrance point of Long Harbour.

Long Harbour may be almost considered as part of Ganges Harbour. It is a long narrow creek, its general breadth being 2 to 3 cables, running parallel with and eastward of the latter for 3 miles. Its entrance is between two sloping, rocky points, similar to each other, on the North side of Captain Passage. At a quarter of a mile within the entrance is a high, bare islet, which must be passed on its South side; 1 mile within is another island, somewhat similar, which may be passed on either side. At the head of the creek is a snug place for a ship to repair, &c., but as a harbour it is only adapted to steamers or coasters, and, with the good and easy anchorage of Ganges Har-

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PREVOST ISLAND, lying in the centre of Swanson Channel, is moderately high, thickly wooded, and of an irregular shape. It is 3 miles long, in a N.W. and S.E. direction, $1\frac{1}{4}$ mile in breadth, and on its southern and western sides it is indented by several bays and creeks; its northern side is almost a straight cliffy shore.

Ellen Bay, on the S.E. side of Prevost Island, between Liddell and Red Islet Points, is three-quarters of a mile deep, by one-third in breadth, and affords fair anchorage with all but south-easterly winds in 10 fathoms, mud. *Annette* and *Glenthorne Creeks*, on the western or Ganges Harbour side, are curious, narrow indentations, running into the island for a mile in an E. by S. direction. *James Bay*, in the N.W. side of the island, and on the South side of Captain Passage, offers anchorage in 10 fathoms for one or two vessels of moderate size with southerly winds. *Hawkins Island* is a small rocky islet, with a few bushes on it, lying close off a remarkable white shell-beach on the N.E. side of Prevost Island. From 2 to $3\frac{1}{4}$ cables W. $\frac{1}{2}$ N. of its north-western point, are *Charles Rocks*, three smooth-topped rocks, not marked by kelp, and uncovering towards low water.

ACTIVE PASS.—From Discovery Island, in the southern entrance of Haro Strait, to the Sand Heads of Fraser River, by the Active Pass, is just 40 miles, and the line is almost a straight one. By adopting this route, not only the most dangerous and inconvenient part of Haro Strait is avoided, viz., its northern entrance abreast of the East point of Saturna Island and Potos Island, where the tides are strong and apt to set a vessel down Rosario Strait, or over on the eastern shore, but a distance of nearly 10 miles is saved.

After entering Swanson Channel (page 379) between Admiral and Pender Islands, steer to the eastward of Prevost Island. From Portlock Point, the south-eastern bluff of Prevost, the entrance of the pass bears N. by W. $\frac{1}{2}$ W. $1\frac{1}{4}$ mile. The southern point of entrance, *Helen Point*, is low, bare, and of a yellowish colour; over its northern side rise the high, stony hills, on the southern side of Galiano Island. The entrance itself does not become very apparent until it is approached within a mile. If overtaken by night, or waiting for tide, *Otter Bay*, on the West side of Pender Island, is a good stopping-place; it is a mile North of Mouatt Point, and $2\frac{1}{4}$ miles E.N.E. of the Channel Islands in Ganges Harbour; a very fair anchorage is to be had in the centre of the bay, in 8 fathoms, and no dangers. Ellen Bay in Prevost Island might also be used, but the former is preferred. There are few dangers to be avoided in passing from Swanson Channel through the pass; the principal of them is the Enterprise Reef, two dangerous patches which lie off the West side of Mayne Island.

In passing up Swanson Channel, keep Pelorus Point, the eastern extreme of Moresby Island, open of Mouatt Point, the western extreme of Pender Island.

These two points, just touching, lead very close on to the reef, but open they clear it $1\frac{1}{2}$ cable. If coming out of Navy Channel, a vessel should keep over for Prevost Island until these marks are open. When Helen Point bears N. by E., the reef is cleared, and the entrance may be steered for. There is a passage inside Enterprise Reef which may be taken when both the kelp patches can be seen.

On the western side of Swanson Channel, the uncovering rock, $1\frac{1}{2}$ cable eastward of Liddell Point, must be avoided, and the points northward of it, Red and Bright Islands, should be given a berth of a cable.

Active Pass runs in an E.N.E. direction for $1\frac{1}{2}$ mile, and then turns North for the same distance, fairly into the Strait of Georgia. The average breadth of the channel is about one-third of a mile, and its general depth about 20 fathoms. There are no hidden dangers, but the great strength of the tides, together with the absence of steady winds, renders it unfit for sailing vessels, unless, indeed, small coasters; for steamers it is an excellent channel, and a vessel commanding a speed of 8 knots may take it at any time without fear.*

A quarter of a mile within the southern entrance, and very close off the northern shore, is a rock which uncovers at half tide. This is the only danger, and cannot be said to be in the track of vessels; in passing to the westward, however, against the flood, a vessel should keep rather on the southern side, as the tides set over towards this rock.

Miners Bay, on the South side of Active Pass, where it takes the sharp turn to the northward, affords anchorage, if necessary; but a vessel must go close in to get 12 fathoms, and then she is barely out of the whirl of the tide. A small rock, with only a few feet water over it, is reported by local pilots to exist off Laura Point, the North point of the bay.

In entering or passing out of the northern entrance, the point of Gossip Island, on the West, and also Georgia Point, on the East, should be given a good berth; indeed, the best directions which can be given are to pass through in mid-channel. From thence the Sand Heads of Fraser River bear N. by W. $\frac{1}{2}$ W., distant 11 miles. The Sand Head buoys are visible at 2 or 3 miles.

Tides.—The flood-tide in Active Pass sets from West to East, or from Swanson Channel into the Strait of Georgia; and the ebb, in the contrary direction. The velocity during springs is sometimes 7 knots; at ordinary

* H.M.S. *Termagant* passing through Active Pass in July, 1860, ran on to Laura Point, on the South side, from refusing to answer her helm in making the turn to the northward, the tide at the time favourable and running about 4 knots. H.M.S. *Plumper* and *Alert* were ahead and astern of her at the time. The *Termagant's* draught was 18 ft., and she sat 5 ft. by the stern; an under current striking her heel was probably the cause. H.M. steam-ships of equal size and greater length had passed through previously on several occasions.

tides, from 3 to 5 knots. In the northern entrance there is sometimes a heavy tide ripple, caused by a patch of 7 and 9 fathoms, and by the meeting of the tide through the pass with that in the strait.

TRINCOMALIE CHANNEL commences at Active Pass, from the southern entrance of which its general direction is W.N.W. for 24 miles, when it enters Dodd Narrows.

Like all the inner channels already described, this one must be classed as essentially a channel for steamers or coasters; it can only be used with advantage by vessels bound to the eastern ports of Vancouver Island below Nanaimo, or by such as choose to enter Nanaimo itself by that contracted pass the Dodd Narrows.

The eastern side of the channel is formed by the long narrow islands of Galiano and Valdes, and the western by Admiral, Kuper, and Thetis Islands. Some smaller islands are scattered over it, and there are also several rocks which require to be known and avoided; nevertheless, with the assistance of the chart, and these directions, it is a desirable and safe channel for the class of vessels before mentioned. The general depth of water is not inconvenient for anchorage if necessary, as it rarely exceeds 30 fathoms, and from 12 to 18 fathoms can generally be found at a convenient distance from the shore. Montague Harbour, on the western side of Galiano Island, is a good stopping-place, also Clam Bay on the East side of Thetis Island.

There are two passes leading into the Strait of Georgia, viz., the Portier and Gabriola; both are intricate and dangerous unless to those perfectly acquainted with them, and the tides are so strong, and varying in their set, that they cannot be said to be applicable to the general purposes of navigation, and few vessels would be justified in using them, unless in cases of emergency.

Montague Harbour is formed between the S.W. side of Galiano Island, and Parker Island, and its entrance, between Phillimore Point and the small island of Julia, is $1\frac{1}{2}$ mile W.N.W. from the West entrance of Active Pass. The entrance is but little over a cable in breadth, but has deep water, and is free from danger. Immediately within the points it widens out to a quarter of a mile, and anchorage may be obtained in 8 to 10 fathoms in the arm which leads to the harbour. There is a narrow passage to the north-westward from this harbour into Trincomalie Channel.

Several smaller islands extend W.N.W. of Parker Island, viz., *Sphinx*, *Charles*, *Wise*, and *Twin Islands*, the latter two rather remarkable rocky islets about 30 ft. high.

Atkins Reef lies on the western side of Trincomalie Channel, one-third of a mile from the shore of Admiral Island, and in the track of vessels working up or down. It is a cable in extent, and covers at 4 ft. flood, its neighbourhood being marked by kelp, which, however, is rarely seen when there is any ripple on the water. The reef bears from Peile Point, the N.W. end

of Prevost Island W. by N. $\frac{1}{2}$ N., $3\frac{1}{2}$ miles; and from Twin Island S. $\frac{1}{2}$ E., $1\frac{1}{2}$ mile.

Walker Hook is formed by a peninsula or tongue of land projecting from Admiral Island, 4 miles westward of Captain Passage. On its S.E. side is fair anchorage for small vessels in 6 fathoms, but a shoal patch marked by kelp lies 2 cables eastward of the S.E. point of the peninsula.

Governor Rock is a dangerous rocky patch lying almost in the centre of Trincomalie Channel. It has 4 ft. on it at low water, is about half a cable in extent, and though kelp grows on it, yet it is very difficult to make out until quite close to. From Twin Island it bears W. $\frac{1}{2}$ S. $1\frac{1}{2}$ mile; from the S.E. point of Walker Hook N.W. by N. $1\frac{1}{2}$ mile; and from *Quadra Hill* S.S.W. This hill cannot be mistaken; it rises from the centre of Galiano Island to the height of 746 ft., and a remarkable white basaltic cliff will be seen on the coast immediately southward of it.

Walker Rock lies North two-thirds of a mile from Governor Rock, and is scarcely less dangerous, except that it uncovers at half ebb. From Twin Island it bears W. by N. $\frac{1}{2}$ N. $1\frac{1}{2}$ mile, from Quadra Hill S.W. by S., and is distant two-thirds of a mile from the shore of Galiano Island.

These two rocks are the principal dangers to be avoided in Trincomalie Channel; they are both steep-to, and may be passed if necessary at half a cable's length.

Directions.—In passing up or down Trincomalie Channel, vessels may either take the passage southward of Governor Rock, or that between it and Walker Rock, or northward of the latter. If taking the southern passage, after having cleared Atkins Reef, Walker Hook, and the shore of Admiral Island, which is bold, should be kept aboard within half a mile, until Quadra Hill bears N.E., when a vessel will be to the westward of both rocks, and may steer over towards the S.E. end of Narrow Island, giving it a berth of at least a quarter of a mile, as a reef extends off it.

If passing northward of Walker Rock when bound westward up the channel, keep Parker and Wise Islands aboard within half a mile; there are no dangers off them. When abreast Twin Island, which may be passed within 2 cables, haul in to the northward until Mount Sutil, on the southern end of Galiano Island, is well open northward of Twin, or until the mountain is on with Charles Island. Run up with these marks on astern (which will lead well inside Walker Rock) until Quadra Hill bears N.E. by E.

Coming down Trincomalie Channel, and desiring to pass northward of Walker Rock, keep over on the Galiano Island shore until the N.E. point of Thetis Island is shut in by the South point of Hall Island. As long as these points are not opened a vessel will be northward of the rock, and when Quadra Hill bears North, she will be well eastward of both it and Governor Rock.

HOUSTON PASSAGE leads from the Trincomalie into Stuart Channel. Vessels intending to take it had better pass up southward, or inside Governor

Rock. The entrance is between the N.E. point of Admiral Island and Narrow and Secretary Islands; there are no dangers.

Southey Point is the sharp northern extreme of Admiral Island, and may be approached to a cable's length to the northward. At half a mile S.S.W. of it is Grappler Reef described in page 378; round it Houston Passage turns abruptly to the southward, and Stuart Channel may be entered either by the main passage between North Reef and Admiral Island, or if necessary, between North Reef and Tent Island. Give North Reef a moderate berth, as a shoal ridge of rocks extends one-third of a mile off its N.W. and S.W. ends (page 377).

PORTIER PASS separates Galiano from Valdes Island, and is the first outlet into the Strait of Georgia, northward of Active Pass, from which it is distant 14 miles. The pass, though short (not exceeding a mile from its southern entrance until fairly in the strait) is narrow, and is rendered still more so by sunken rocks on its western side. The tides are very strong, running from 4 to 7 knots, and overfalls and whirling eddies are always to be met in the northern entrance. No vessel but a steamer commanding a speed of 8 knots is recommended to take it unless in a case of emergency. The first danger in the southern entrance is *Black Rock*, just awash at high water. It is on the western side of the pass E.S.E. $1\frac{1}{2}$ cable from Native Point, the N.W. entrance point, and is easily avoided.

The second and principal danger is *Virago Rock*, almost in the centre of the channel, but rather on the western side. It only uncovers at low tides, and bears from Native Point E. by N. $\frac{1}{2}$ N. 2 cables, and from Race Point, the centre projecting point on the East side of the pass, S.W. by W. a little over 2 cables, which is the least breadth of the passage. The third danger is a 2-fathoms rocky patch, extending from one of the outer East points of the pass, bearing from Race Point N.E. by N. $\frac{3}{4}$ N., a third of a mile, and from Tongue Point, the outer East point, W. by N. $\frac{3}{4}$ N. 3 cables' lengths; this patch is covered with kelp, which is generally visible.

Directions.—At any stage of the flood stream a steam-vessel acquainted with the channel might pass out into the Strait of Georgia with facility. The eastern shore should always be kept aboard within a cable's length until beyond Race Point, which should be passed close, after which a vessel with the flood stream should make for Canoe Islet, a bare yellow rock about 20 ft. high, N.N.W. two-thirds of a mile distant, in order to clear the 2-fathoms patch. Canoe Islet is clear of danger on its western side, but its eastern side should not be approached within 3 cables' lengths.

In passing out of the channel with the ebb-tide, the great danger to be avoided is the violence of the stream setting against and round Race Point, which, if a vessel have not sufficient power to stem, will either take her on the port bow and set her on the point, or, which is still more probable, on the

starboard, and set her on Virago Rock, as was the case on one occasion with H.M. steam-vessel of that name.

Entering Trincomalie Channel from the Strait of Georgia by this pass, a vessel should keep a third of a mile eastward of Canoe Islet, and then steer for Race Point, due allowance being made with the flood for the 2-fathoms patch; if with the ebb, Race Point should be kept close aboard to avoid being set on Virago Rock, and having passed the point, hug the eastern shore, which is clear of danger. The rule on all occasions should be to avoid the western shore; the great strength of the tide ceases immediately on clearing the entrance points either way. From the Strait of Georgia the pass is always easily recognized at the distance of several miles, by the gap formed by its sloping wooded entrance points, terminating in two low extremes, from most points of view overlapping each other. Steer for the entrance on a bearing about S. by W.

Tides.—The flood tide runs from Trincomalie Channel to the northward into the Strait of Georgia, and the ebb in the contrary direction. The ebb stream commences from 1 to 1½ hour before it is high water by the shore, and for 1 hour after low water, or from 7 to 8 hours. The high water at the full and change of the moon occurs about 6 p.m., but is not very regular.

CLAM BAY is on the eastern sides of Thetis and Kuper Islands, opposite to Portier Pass. The continuation of the bay separates these two islands at high water, when there is a boat channel into Telegraph Harbour (p. 378), on their western side. A remarkable white spit point of broken clam shells, seen from a long distance, forms the southern entrance point of the bay; immediately southward of it is a considerable native lodge. *Leech Island*, off the northern point, is a small wooded islet. *Centre Reef*, with 7 ft. on it, and marked by kelp, lies almost in the centre of the entrance.

The best passage into Clam Bay from the eastward is northward of Narrow, Secretary, and Indian Islands, between them and Hall Island. After passing Indian Island steer in for White Spit, giving it a berth of a cable, and anchor in 6 fathoms in the centre of the bay, the spit bearing East, and Leech Island N.N.W.

There is fair anchorage on the western side of Valdes Island, 2 miles above Portier Pass, immediately off a yellow cliff; 8 fathoms, sandy bottom, will be found with the cliff bearing N.W. by N. distant a quarter of a mile.

DODD NARROWS may be said to commence above Round Island (p. 377), although the narrowest part is a mile distant from it. To small vessels or steamers of sufficient power to obey their helm quickly, this narrow pass offers no dangers. The strength of the tide at its greatest rush is above 8 knots, the least depth of water 7 fathoms, and the narrowest part of the channel is 80 yards wide; but this is for a short distance, and the pass being nearly straight, a vessel is carried through in a few moments.

If bound through Dodd Narrows, and having to wait for tide, there is fair

anchorage with but little tide, westward of Round Island in 6 fathoms, midway between it and the shore.

In proceeding for Dodd Narrows from abreast Portier Pass, the mid-channel course is W.N.W. for about 3 miles, or until Ragged Island and Reef Point of Thetis Island are in one, bearing S.W. by S. The most direct course is northward of Danger Reef, between it and Tree Island; the latter is a small round wooded islet, lying off the South end of De Courcy Islands. This passage is two-thirds of a mile wide, with a depth of 25 to 30 fathoms.

Danger Reef (p. 378) should not be approached within a cable, where there is 9 fathoms; if the reef should not be seen, it is recommended to pass Tree Island at the distance of a quarter of a mile. There is deep water between it and De Courcy Islands.

The passage between White Rock and Danger Reef is likewise a very good one; it is three-quarters of a mile wide, with a depth of 20 to 30 fathoms.

In passing up, keep on the starboard or eastern side of Round Island at a convenient distance; the only directions necessary after this are to keep in mid-channel, and to attend the steerage quickly and carefully. Immediately through the Narrows the tide ceases, and a vessel will be in Northumberland Channel, a fine wide passage leading to, and only 5 miles from, the anchorage at Nanaimo.

In taking the Narrows from the northward, be careful not to mistake the False Narrows, which are on the port or northern side of Northumberland Channel, and are much wider than the real pass, but nearly dry at low water. Dodd Narrows are not so easy to pass from the North as from the South, as in the former case the slight bend that has to be made must be made immediately on entering the narrow part. The tides should be studied in passing either way. It is not recommended to attempt it with the full rush of the stream; an hour before or after low water there is no difficulty to a steam-vessel.

It is high water in the Narrows on full and change days at 3^h 30^m p.m., and low water at 9^h 30^m a.m., and on those days the flood stream commences at low water, and runs about 7 hours. The first of the flood is the best time to pass the Narrows. Vessels leaving Nanaimo and intending to pass down, should be at the Narrows an hour before high or low water, as the tides are nearly an hour earlier at the Narrows.

PYLADES CHANNEL.—*De Courcy Islands* are a group extending 4½ miles in an E.S.E. direction from Mudge Island, which separates the False from Dodd Narrows, and on their northern side, between them and Valdes Island, is Pylades Channel, which leads by the Gabriola Pass into the Strait of Georgia, as well as to the entrance of False Narrows. The average breadth of the channel is a mile, with a depth of 35 fathoms, and at its head, near the entrance to False Narrows, is good anchorage in 9 fathoms, convenient for vessels intending to take Gabriola Pass and waiting for tide.

False Narrows are full of kelp, and shoal at low water, affording only a boat

passage into Northumberland Channel. The passages between De Courcy Islands are deep and navigable; that between the North and Middle Islands is half a mile wide, and free from danger. The narrow pass between the Middle and South Islands is scarcely a cable wide, but has a depth of 5 fathoms.

GABRIOLA PASS, between the South end of Gabriola Island and the North end of Valdes Island, is not recommended, unless for coasting vessels knowing the locality, or steamers, if necessary, for it is a narrow and intricate channel, something of the same character as Dodd Narrows, except that it is a much longer reach. Its direction is E.N.E. for little over a mile, its narrowest part is not over 250 yards in breadth, and the shoalest water is 6 fathoms; half a mile E.N.E. from this narrow, the course changes to S.E. by E., leaving a narrow ridge of low wooded islands on the starboard hand, off which a chain of covering rocks marked by kelp extends for nearly 2 cables; two-thirds of a mile on this course leads into the Strait of Georgia, when the Gabriola Reefs must be avoided. These latter are an extensive group of rocks, uncovering at low water, at $1\frac{1}{2}$ mile eastward of Flat-top Islands, and are fully described hereafter. Much broken ground exists in their neighbourhood, and it is desirable to give them a good berth. They are marked by a beacon, and a buoy was moored N.E. of Thrasher Rock at their outer extremity.

The north-eastern side of Vancouver Island will be described hereafter, with the description of the Strait of Georgia, &c.

VANCOUVER ISLAND.

This extensive island has a similar relation to the Pacific Ocean to what the south-western part of England has to the Atlantic, and in many respects their climates resemble each other. But the physical characteristics of the two are widely different. The rugged coasts of Vancouver Island rise steeply from the water, backed by rounded hills, covered with the monotonous pine groves, beyond which, and traversing the island, a loftier range of bare rugged mountains culminates in a series of irregular peaks.

It is about 252 miles long, varying from 20 to 65 miles in breadth, and has an area of about one-fourth of that of England and Wales. On its S.W. face it is very deeply indented by those singular inlets so characteristic of the adjacent mainland. There is very much land quite unfit for cultivation or colonization, but in some of the valleys and along a portion of the river banks are tracts of surpassing fertility. It is estimated that the area of the island amounts to about 10,000,000 acres, of which 389,000 acres are arable land.

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winds which prevail over the Pacific, the mountains, intercepting the rain clouds, furnish an abundant and never-failing supply of water, which may be certainly found at every valley or beach. The forests afford some of the finest timber in the world, whether as the largest and straightest spars for ships or for building purposes, and a large and increasing trade is rising around the saw-mills, which are established in various parts. At the same time the rocky and barren shores are covered in many places with a stunted growth of useless wood. Of other supplies, the natives in the districts away from the European settlements, will bring deer, grouse, salmon, halibut, rock-cod, and other fish, in moderate quantities and for reasonable prices, in exchange for blankets, common sheets, knives, tobacco, &c. Copper and iron have been found, especially in Barclay Sound. Traces of gold have also been met with.

Coal is one of the most important of the possessions of Vancouver Island, and appears to exist in vast quantities, and of excellent quality. It was first discovered at Nanaimo, from Indian report, by Mr. Joseph McKay, in May, 1850. In September following the same seam, called Douglas seam, was discovered on Newcastle Island, in Nanaimo Harbour. Its general thickness is from 6 to 7 ft., with from 8 to 10 inches of fire-clay running through the centre. Other and larger seams than this have since been discovered on the adjacent coast, and still further examination has demonstrated that there is an unbounded supply, which is now very extensively worked.

Capt. W. Colquhoun Grant, F.R.G.S., its first colonist, in 1843 made an elaborate examination of the capabilities of the island in its original uncolonized state, and in few words his views are thus: The whole centre of the island—as far as it has been at present explored—may be said to be a mass of rock and mountain, and of the little available land which is found in patches along the sea-coast, by far the greater part is densely covered with timber, the removal of which would be so laborious as to make the bringing of the said land under cultivation scarcely a profitable undertaking. The little open land which there is, however, is in general rich, and had the British Government thrown the island open to the exertions of individual enterprise, the greater portion of such open land would doubtless, ere this, have been settled. It is not, however, always that the wooded land is capable of cultivation along the sea-coast; on the contrary, the reverse is the rule; the greater portion of the land on the southern, and nearly all on the western coast, as far as it has yet been examined, consisting of barren rock, barely affording sufficient holding ground to the stunted timber with which it is covered.

His opinion of the climate, too, is not very cheerful. He says:—"The climate, as usual on the coast of the Pacific, is divided into two seasons of dry and rainy, or, as Père Accolti, the Jesuit priest of Oregon, expressed it, 'Huit mois d'hiver, et quatre d'enfer;' he added two months, however, to the winter for the benefit of Oregon. On Vancouver Island it generally rains and snows

from October to March, and during the rest of the year a parching heat prevails, which dries up all the small streams. In the commencement of autumn dense fogs prevail, enveloping everything in obscurity, and preventing, as I think, the rays of the sun from having a due vivifying effect on the crops.

"The prevailing winds along the coast in winter are from the S.E., varying from that to the S.W., and with occasional heavy northerly gales; the prevailing winds in the summer are from the North and N.W. Generally speaking, the climate is both agreeable and healthy; and not a single death, that I am aware of, has occurred among adults from disease during the six years that I have been acquainted with the island."*

Dr. Rattray gives the following characteristics of the different seasons in the South part of the island. The spring is short, and lasts from the beginning of March to the end of April or beginning of May. In early March the weather undergoes a marked change, and a drier and milder climate forms a decided contrast to the cold and wet winter months which precede it. Towards the end of April fine weather has fairly set in, with mild dry S.W. winds.

The summer begins with May and ends with September. Rain falls seldom, and never heavily; fogs and mists are rare; sometimes the heat is excessive. The autumn, which lasts during October and November, presents a marked change. Cold and moist northerly winds succeed the dry southerly breezes of summer. Fogs begin in October, and occasionally during the latter part of September; but periods of fine mild weather, sometimes lasting ten days or a fortnight, form what is called the "Indian summer."

During the winter, which lasts from the beginning of December to the end of February, cold moist northerly and southerly winds prevail, with frequent rain and fogs. Snow is uncommon and never heavy; ice is seldom more than an inch thick.

The following remarks are from the Vancouver Island Pilot:—

Currents.—A southerly current has been found to prevail on the western coast of Vancouver Island more or less throughout the year, particularly from August to November, probably in some measure caused by the N.W. winds which blow constantly during the summer. This current, joining the ebb tide out of Fuca Strait, has been known to set vessels between 4 and 5 miles an hour to the southward, and during fogs there is great risk of being drifted on to Cape Flattery, or some of its off-lying dangers; extreme caution should, therefore, be observed in entering the strait at such times, especially near the full and change of the moon, when the tides are at their strongest.

Winds.—During summer, the prevailing winds from N.W. or S.W. take a westerly direction within the Strait of Juan de Fuca; while the S.E. gales of winter blow fairly out.

Although a westerly wind may be blowing within the strait, it frequently,

* See Journal of the Royal Geographical Society, vol. xxvii, pp. 268—320.

during the change of the seasons, blows heavily outside at the same time from S.S.W., or sometimes suddenly changes to that direction, from a slight easterly wind on opening the entrance, which makes that part of the coast of Vancouver Island between Port San Juan and Bonilla Point a dangerous lee shore to a ship without steam power.

The coast winds in summer prevail from S.W. and N.W., the former during the early months, and the latter blow fresh and with great regularity during June, July, and August. In September and the early part of October the winds are very uncertain, and there is generally a great deal of calm, gloomy weather.

The barometer usually stands above 30.00 inches during summer; should it fall to 29.90 a south-easterly wind, with thick rainy weather, may be expected, but of short duration, and clearing up with a westerly wind as soon as the barometer rises.

The winter winds are S.E. or S.W., more frequently the former. They set in towards the end of October, and continue until the middle of April. S.E. gales are generally preceded by a short interval of calm, cloudy weather; they spring up gradually from East or E.S.E., veering to the southward, accompanied by rain and thick weather, the barometer falling rapidly; when the barometer becomes stationary, the wind shifts suddenly to S.W., and blows heavily with clear weather, but frequent squalls of rain. The barometer begins to rise immediately the wind veers to S.W., from which quarter it generally blows from 12 to 20 hours.

The violence and duration of these S.E. gales is always proportioned to the fall of the mercury; with the barometer at 29.50 a strong gale may be looked for from this quarter. It seldom falls below 29.20, when very bad weather is certain to follow. On two or three occasions, in as many years, it has been known to fall to 28.90, and has been followed by S.E. gales of great violence.

A S.E. gale sometimes springs up, though very seldom, with the barometer above 30.00 inches. On such occasions the wind has always been preceded by calm, cloudy weather and rain, with a high but falling barometer; such gales are not violent, and are of short duration.

S.E. gales are always accompanied by thick dirty weather, and rain; they seldom continue from that quarter for more than 12 or 18 hours, unless the barometer falls very low, and almost always shift to S.W.

When the S.W. gale of winter is not preceded by the south-eastern, the barometer seldom falls; it either remains stationary, when the gale may be expected to continue longer, or rises slowly, when it will gradually subside and fine weather follow. S.W. gales are accompanied by heavy banks of clouds, and passing showers of rain, sometimes snow.

The barometer has been known to fall during winter as low as 29.45, and has been followed by no gale or bad weather, but on such occasions there has

been a heavy fall of snow on the hills, and a sudden fall of 15 degrees in the temperature.

A fine northerly or N.E. wind frequently occurs at intervals during the months of December, January, and February; it is always accompanied by a high barometer, above 30.0, and at such times a continuance for several days together of clear, cold, frosty weather may be looked for. The barometer on these occasions will sometimes rise as high as 30.70, and the fine weather will probably last a fortnight or more.

Fogs.—Although fogs in this region are not nearly of such frequent occurrence as on the neighbouring coast of California, where they prevail almost uninterruptedly during summer and as late as the middle of October, yet from August to November they occasionally occur in Juan de Fuca Strait, and are sometimes very dense over the entrance for several days together. They are generally accompanied by calms or very light winds from N.W., which renders them more dangerous to sailing vessels closing the land.

The natives have been frequently described since the visit of Capt. Cook to Nootka Sound first made us intimate with them; but they are disappearing fast. The West coast of the island is very thinly populated, the highest estimate of the natives not exceeding 4,000, divided into a number of very small tribes. As a rule they are harmless and inoffensive, though in a very few cases the crews of vessels wrecked on their coasts have been plundered and ill-treated. They are addicted to pilfering, especially in the vicinity of Nootka Sound, and ought to be carefully watched; this is, perhaps, the worst charge that can be brought against them.

All the tribes speak a different dialect, and the Chinook jargon, which is used at Victoria in transactions with the settlers and natives, will not be generally understood on the West coast.

The island now forms an integral part of the province of British Columbia, as explained on page 350, the seat of government for the island and continent being at Victoria.

Its S.W. coast was but very little known till the publication of the fine series of charts, the result of the elaborate survey by Capt. G. H. Richards, R.N., in H.M.S. *Plumper*. To these charts, and the directions which elucidate them, we owe the following description, which is somewhat abridged, as, for the present at least, many of the places it describes are but of little interest to the general navigator.

The present chapter will include a description of the south-eastern and south-western coasts of the island, leaving that portion on the Gulf of Georgin, &c., to be given in the next chapter.

JUAN DE FUCA STRAIT has been before described, pages 321—331, with the harbours and coast on the South side, the northern limit of Washington Territory. We now commence with the northern side of the strait, continuing

the description from the N.W. point of the entrance to its junction with Haro Strait.

PORT SAN JUAN is the first anchorage on the North shore within the entrance of Fuca Strait. The opening, which is remarkable from seaward, is seen for a considerable distance, and makes as a deep gap between two mountain ranges. The centre of the entrance bears N.E. by N. $\frac{1}{2}$ N. from Cape Flattery lighthouse, and as the light is visible from the anchorage it is not difficult to enter or leave during night time. The entrance points lie E. $\frac{1}{2}$ N. and W. $\frac{1}{2}$ S. of each other, nearly $1\frac{1}{2}$ mile apart. The port runs nearly straight for $3\frac{1}{2}$ miles in a N.E. by N. direction, and carries a breadth of $1\frac{1}{2}$ mile almost to the head, which terminates in a round beach composed of muddy sand. *Gordon River* empties itself through the North end of this beach, and *Cooper Inlet* penetrates its southern end; small vessels can enter these at high water.

Off *Owen Point*, the western point, at something more than a cable's length, is a low flat rock, named *Owen Island*, awash at high water. *Observatory Rocks*, at the eastern point, are high pinnacles, with two or three trees growing on them, and some smaller rocks off, the outermost of which lies $1\frac{1}{2}$ cable from the shore. At 4 cables within these rocks, and $1\frac{1}{2}$ cable from the shore, is another reef, partly out of water, named *Hammond Rocks*. On the North side of the port some rocks and broken ground extend for a mile within Owen Point, and nearly 2 cables from the shore. The outermost rock, awash, lies N.E. $\frac{1}{2}$ E. from Owen Island, distant 4 cables, and is $2\frac{1}{2}$ cables from the shore.

The port is entirely open to S.W. winds, during which a heavy sea rolls in if blowing a moderate gale, but there is a convenient depth of water all over it, from 6 to 9 fathoms, the bottom fine muddy sand. In the outer part of the port there is generally a swell. Good anchorage will be found about $1\frac{1}{2}$ mile from the head, with Owen Island bearing S.W., and Adze Head E.S.E., in 7 fathoms, with all winds from the land. It is not considered advisable to remain here when there is any sign of the wind shifting to the south-westward; vessels should then seek shelter in Neeah Bay, or run farther up the strait.

The hill named *Pandora Peak*, on the N.W. side of the port, does not show as a peak within the port.

The Coast.—From Port San Juan the shore of Vancouver Island trends East to Sherringham Point, distant 24 miles, and presents no very remarkable features. *Providence Cove*, fit for boats, lies 3 miles eastward of San Juan; and at 7 miles farther East, in a small bight, is a stream named *Sombrio River*. The *River Jordan*, a considerable stream, is $5\frac{1}{2}$ miles westward of Sherringham Point. Eastward of Sherringham Point the shore curves a little to the northward, and at the distance of $4\frac{1}{2}$ miles E. $\frac{1}{2}$ N. is *Otter Point*. The points on this side the strait are not remarkable nor easily distinguished unless close in-shore; some of their extremes are partially bare of trees. Vessels running or working up the strait at night should be careful not to get so near the North

shore as to shut in Race Island light by Beechey Head. From Otter Point the entrance to Sooke Inlet is E. by N. $\frac{1}{2}$ N. $3\frac{1}{2}$ miles, the intervening coast forming rather a deep indentation named Sooke Bay, in which vessels may anchor in fine weather something more than half a mile from the shore in 8 fathoms.

SOOKE INLET is a remarkable sheet of water; its entrance is little over half a mile in breadth, and leads by a narrow and tortuous channel 3 miles in length, and in a general North direction, to a beautiful landlocked basin, nearly 2 miles in extent, in an East and West direction, and 1 mile North and South, with a depth of from 8 to 16 fathoms all over it. It is not likely, however, to become a harbour of much importance. The houses of settlers here begin to appear near the coast.

Vessels may anchor in 10 fathoms half a mile off the entrance, and, if necessary for shelter, may with a fair wind run inside Whiffin Island, where there is sufficient space to anchor. From the depth of 10 fathoms *Mount Maguire*, on the eastern side of the inlet, bears about N.E.; it is partly covered with trees.

Whiffin Island is low, gravelly, and always connected with the western shore of the entrance. Its eastern point bears N.N.E. three-quarters of a mile from the centre of the entrance; it must be rounded close, leaving it on the port hand, as a reef lies only half a cable eastward of it. On rounding the point drop the anchor at a cable's length within in 8 fathoms; here there is a space of deep water 2 cables in extent.

Secretary Island, small and wooded, lies $1\frac{1}{2}$ cable off Possession Point, a mile south-eastward of Sooke Inlet. There is a depth of 16 fathoms between it and the main shore, and from it Beechey Head bears E. $\frac{1}{2}$ S. $2\frac{1}{2}$ miles, with a bold steep shore between, and deep water close-to.

BECHER BAY.—*Beechey Head* is a bold wooded cliff, forming the West entrance point of Becher Bay, *Cape Church*, to E. by N. $\frac{1}{2}$ N., being the eastern one. Three rocky islets lie off the latter. The breadth of the entrance is $2\frac{1}{2}$ miles, and off the eastern side are several small wooded islands, named Bedford Islands. The depth of water at the entrance varies from 20 to 50 fathoms, rocky and irregular bottom. At three-quarters of a mile within, in a northerly direction, are Wolf and Frazer Islands, with some small islets off them; between these two islands, which lie East and West of each other, Frazer Island being on the eastern side, is the channel 4 cables wide to the anchorage; it then takes a north-easterly direction for three-quarters of a mile, where anchorage in 10 fathoms may be had, with the centre of Frazer Island bearing S.S.W., distant a quarter of a mile.

Becher Bay cannot be recommended as a good anchorage; it affords no great shelter with southerly or westerly winds, and vessels outward bound had far better wait a fair wind in Parry Bay to the northward of Race Islands. The currents have very great strength around Beechey Head. Vessels bound up the strait should pass the land about Beechey Head at the distance of 2 miles,

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if intending to go outside Race Islands. Steamers intending to take the Race Passage may pass Cape Church about half a mile distant, and keep the land aboard about that distance until up with Bentinck Island, when the latter should be closed and kept within a quarter of a mile or just outside the kelp. The passage between Bentinck Island and the Vancouver shore is choked with rocks, and strong tides run both inside and outside.

RACE ISLANDS are a cluster of low bare rocks, the outermost of which lies a mile S.E. of Bentinck Island at the S.E. point of Vancouver Island, and 5 miles E. by N. from Beechey Head. They occupy more than half a mile in extent, North and South, and the same East and West. The outermost and largest, or Great Race, is $1\frac{1}{2}$ cable in extent, and 25 ft. high; the others are smaller, a few feet above high water or awash. The tides among them run from 3 to 6 knots, and during bad weather heavy and dangerous races occur. The outer rock should be given a berth of a mile, at which distance from 40 to 50 fathoms of water will be found; it may, however, if necessary, be rounded at a less distance, the most off-lying danger being *Rosedale Rock*, with 5 ft. on it, lying S.E. by E. from Great Race, distant 4 cables. In light winds a sailing vessel should give these islands a good berth, especially when eastward of them, as the ebb sets strongly towards them.

Race Island Lighthouse, on Great Race Rock, consists of a keeper's dwelling of stone, with a tower of the same material, 105 ft. high, the latter being painted with alternate horizontal black and white bands. It exhibits, at an elevation of 118 ft. above high water, a *flashing bright* light, which shows a *flash* every *ten seconds*, visible in clear weather at a distance of 18 miles. Lat. $48^{\circ} 17' 45''$ N., long. $123^{\circ} 32' 15''$ W.

In foggy weather a steam *Whistle*, a short distance S.E. of the lighthouse, sounds a blast of 5 seconds at intervals of 72 seconds.

Race Passage is a clear channel, 4 cables in breadth, between Race Rocks and Bentinck Island, with a depth of not less than 14 fathoms. This passage may be taken by a steamer; but it is not recommended for a sailing vessel under ordinary circumstances, on account of the strength of the tides, and races caused by the irregular rocky nature of the bottom. The course through is N.N.E. and S.S.W.

After rounding Race Island lighthouse at the distance of a mile, the course for Esquimalt Harbour is N. $\frac{1}{2}$ W., $8\frac{1}{2}$ miles. The lighthouse on Fisgard Island is very conspicuous, and will be seen immediately on rounding Race Islands; a course direct for it will clear all dangers, but attention must be paid to the set of the tides. The ebb runs almost directly from the Haro and neighbouring straits towards Race Islands, and a sailing vessel, unless with a commanding wind, should give them a berth of more than a mile. The flood sets in the opposite direction to the N.E., and with light winds vessels are liable to be carried to the eastward.

By night, when Fisgard Island light bears N. by W., a vessel may steer

boldly for it. The only precaution necessary is to keep the bright light in full view.

The entrance of Victoria Harbour being only 2 miles eastward of Esquimalt, the same precautions are necessary as regards the tides. The course from a mile off Race Islands is N. $\frac{1}{2}$ E.; during daytime Christ Church, a conspicuous white building with a spire, and standing on an eminence, will be seen shortly after rounding these islands, bearing N. by E. It should be kept just on the starboard bow. At night, or during bad weather, it is strongly recommended not to run for this harbour; but if it is decided to run for Victoria, it must be borne in mind that when Fisgard Island light changes from bright to red, a vessel will be very near the shore.

Bentinck Island, lying close off the S.E. point of Vancouver Island, is little over half a mile in extent, irregularly shaped, and 100 ft. high, being almost divided in the centre by a narrow neck. The narrow channel between the island and the shore is obstructed by numerous rocks.

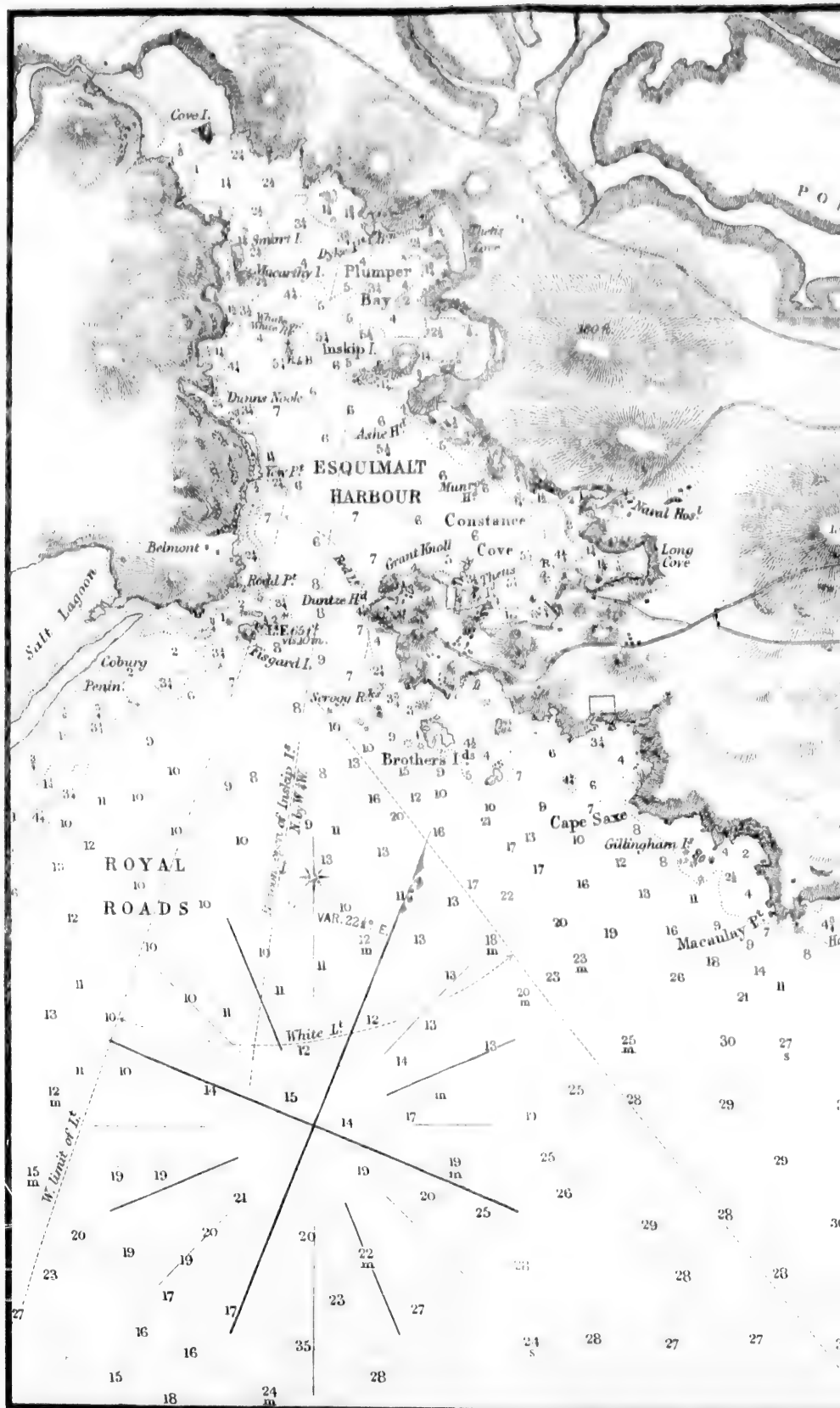
Between Bentinck Island and Esquimalt Harbour, a distance of 8 miles, the coast is indented by several bays, and anchorage may be obtained in 8 to 10 fathoms anywhere within a mile of the shore, except immediately off Albert Head. The only danger is a reef lying about a cable's length off the head.

Pedder Bay, the first of these indentations, has its entrance immediately northward of Bentinck Island, 2 miles N.N.W. of the Great Race, between Cape Calver and William Head, where its breadth is three-quarters of a mile. The inlet runs to the W.N.W. for 2 miles, narrowing rapidly, and when half a mile within is only fit for small craft, which may find good shelter at its head. Vessels of any size may anchor in the entrance in 7 fathoms, with winds from the southward and westward.

Parry Bay, immediately northward of William Head, affords good anchorage with all westerly winds. Vessels bound to sea, and meeting with a strong wind from this quarter are recommended to return here; the anchorage is in 9 fathoms, from half to three-quarters of a mile off the sandy beach, with William Head bearing S.W. by S. about the same distance. With a southeasterly wind there is ample room to get under way.

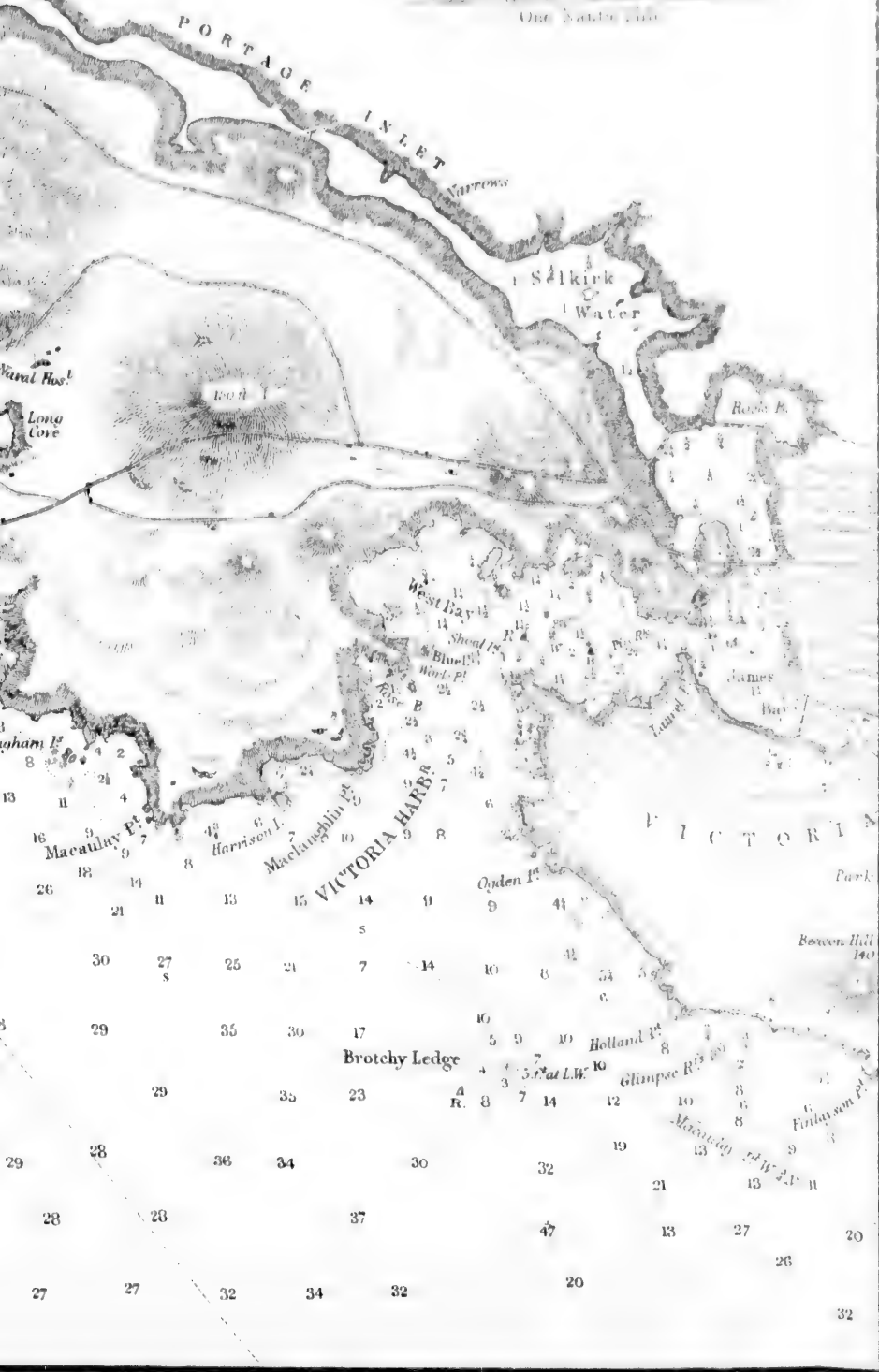
Albert Head, the North point of the bay, is moderately high, sloping to the sea, bare of trees at its extreme, but wooded immediately behind; a reef lies a cable off it. **William Head** somewhat resembles it, but is lower. The water is too deep for anchorage immediately off these heads.

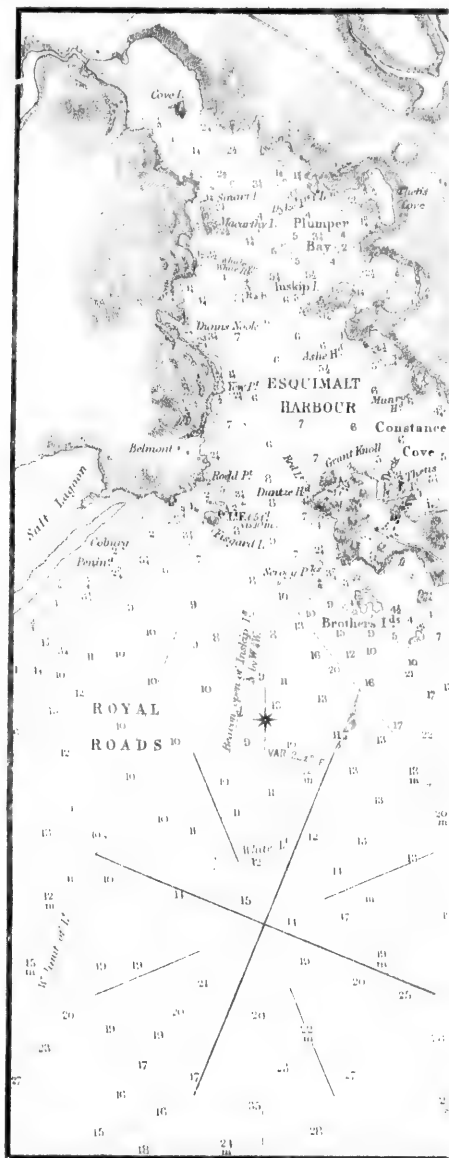
ROYAL BAY or ROADS, of which Albert Head is the southern point, and the entrance of Esquimalt Harbour the northern limit, is a fine sheet of water 3 miles in extent, and affords good anchorage with all winds which would prevent a vessel from entering that harbour. A vessel may anchor anywhere within three-quarters of a mile from the western shore, in 10 to 12 fathoms. A good berth is a mile South of Duntze Head with the entrance open, or the beacon on Dyke Point, near the site of Thetis cottage, just open of Inskip



ESQUIMALT & VICTORIA HARBOURS.

One Nautical Mile





Rocks (in the harbour), which is the leading mark for clearing Scroggs Rocks running in or out.

LIGHT.—A lighthouse is erected on the summit of *Fisgard Island*, a small rocky islet 25 ft. high, and almost connected with the shore, forming the western entrance point of Esquimalt Harbour; the tower is of brick, white-washed, and 57 ft. high, with a red brick dwelling-house adjoining. The light is *fixed*, elevated 70 ft., and visible 10 miles, and shows *bright* when bearing between N. $\frac{1}{4}$ W. and N.W. by W. $\frac{1}{4}$ W.; *red* between N.W. by W. $\frac{1}{4}$ W. and S. $\frac{3}{4}$ E.; and *bright* between S. $\frac{3}{4}$ E. and S.E. $\frac{1}{4}$ E. The bright light is intended to guide a vessel in from seaward, and, while visible, clears alike the western coast between Race Island and Esquimalt, and the southern shore, with its off-lying dangers, Scroggs Rocks and Brotchy Ledge, between Duntze Head and Trial Island. The red light will be found useful by vessels bound to Victoria or Esquimalt from the eastward; after rounding Trial Island it will indicate a vessel's distance from the shore, and if bound to Esquimalt, a W.S.W. course will lead a safe distance outside Brotchy Ledge, until the light changes from red to bright, when it may be steered for, and not before.

ESQUIMALT HARBOUR is a safe and excellent anchorage for ships of any size, and with the aid of the light on *Fisgard Island* may be entered at all times with great facility. These advantages caused it to be selected as a naval station by the Admiralty. The entrance, which bears North $8\frac{1}{2}$ miles from the lighthouse on Great Race Island, is between *Fisgard Island* and Duntze Head, and is 3 cables in breadth, opening out immediately within.

The only dangers are *Scroggs Rocks*, which lie on the eastern side, S.S.E. 3 cables from Duntze Head, and cover at three-quarters flood. Inskip Islands kept well open of the head leads clear to the westward of them, but the best mark for entering with a leading wind is a pyramidal white beacon on Dyke Point, 23 ft. high above high water, just open or on with the western Inskip Rock, bearing N. by W. $\frac{1}{4}$ W., which leads in mid-channel. Thetis Cottage, which formerly stood on Dyke Point, and was used as a leading mark, was destroyed by heavy falls of snow in 1879-80, and the ruins have been removed.

Fisgard Island should not be passed within less than a cable's length, keeping just without the kelp, which extends about half a cable eastward of it, for a rock, with 7 ft. water over it, lies three-quarters of a cable N.E. of the lighthouse.

Entering Esquimalt Harbour, *Fisgard Island* light should be left from 1 to 2 cables on the port hand; when it bears N.W. by W. $\frac{1}{4}$ W., the light changes from bright to red, and shows the latter colour within the harbour; and when it bears S. by W. at a convenient distance, a vessel may anchor in 7 fathoms, or stand into Constance Cove if preferred. Scroggs Rocks, on the eastern side of the entrance of the harbour, must be avoided; they bear E.S.E. from *Fisgard Island*, distant nearly 4 cables.

Vessels entering the harbour at night with a strong wind after them, should take care to shorten sail in time, as the space for rounding-to is somewhat limited; and it is desirable to moor if any stay is intended, as the winds are changeable.

The best time to leave the harbour is early in the morning, when either a calm or light land wind may be expected. There is little strength of tide in the harbour, or for some distance without, and it sets fairly in and out.

The strongest and most frequent gales blow from S.W. and S.E., which are leading winds in, but rarely from N.W. The S.W. is a summer wind, generally fresh, and brings fine weather, unless it blows a gale. South-east winds may be looked for during the winter months, or between November and March, and generally a strong gale once in a month, with rain and thick weather. The N.E. wind rarely blows with much strength, and always brings fine clear weather; a direct South wind, to which some parts of the harbour are open, seldom blows, and there is never sufficient swell to render the anchorage inconvenient.

Whale Rock, with only 7 ft. on it at low water, lies W. $\frac{1}{2}$ N., 2 cables from Inskip Islands, or nearly midway between them and the western shore of the harbour. This rock is of small extent, and not marked by kelp; it has a clear passage on either side, that to the eastward being the widest. Yew and Rodd Points, just touching, point to the rock; Yew Point, just touching the light-house on Fisgard Island, S. by E. $\frac{3}{4}$ E., leads nearly a cable's length westward; and when Ashe Head is well shut in by Inskip Islands, a vessel will be clear to the northward.

Anchorage.—The most convenient anchorage is in *Constance Cove*, on the eastern side of the harbour, immediately round Duntze Head, the general depth being 6 fathoms, and the holding ground good; there is, however, safe anchorage in any part of the harbour, in not less than $4\frac{1}{2}$ fathoms, as far northward as Dyke Point. A cable's length above this point the water shoals to 3 fathoms, and from thence to the head of the harbour is a flat with only a few feet on it at low water.

The town of Esquimalt is situated on the southern side of Constance Cove, and on the northern side of the cove is the Naval Hospital. There is a dry dock here, lately completed, 400 feet long, with an entrance 90 feet wide, having a low water over the sill. Esquimalt is the proposed terminus of the railway to Nanaimo, which, on the completion of the trans-continental Canadian Pacific Railway, will probably very greatly increase the importance of this harbour.

Thetis Cove in *Plumper Bay*, on the eastern side, immediately North of Constance Cove, is a snug anchorage, with the harbour entrance just shut in by Inskip Rocks, in $4\frac{1}{2}$ fathoms; but vessels proceeding above these rocks must take care to avoid Whale Rock.

Water may be obtained during the winter months without difficulty from

the many streams that empty themselves into the different bays, caused by the great quantity of rain which usually falls at that season; but in summer watering is a tedious process, and boats must be sent either to Rowe stream, at the head of the harbour, or to the salt lagoon just outside the entrance. Both offer difficulties, unless at or near high water.

Water, however, might be conveyed, at a trifling expense, from the chain of lakes just over the western side of the harbour, near Colwood Farm.

VICTORIA HARBOUR is a little more than 2 miles eastward of Esquimalt, with its entrance between Ogden and MacLaughlin Points. *Macaulay* or *Sailor Point*, a remarkable projection nearly midway between the two harbours, is a bare flat point, about 30 ft. high, showing as a yellow clay cliff, worn by the action of the sea and weather into a rounded nob at the extreme. The coast on either side of this point for a mile is fringed with sunken rocks, and is dangerous for boats in bad weather, many fatal accidents having occurred.

The entrance to this harbour is shoal, narrow, and intricate, and with S.W. or S.E. gales a heavy rolling swell sets on the coast, which renders the anchorage outside unsafe, while vessels of burthen cannot run in for shelter unless at or near high water. Vessels drawing 14 or 15 ft. water may, under ordinary circumstances, enter at such times of tide, and ships drawing 18 ft. have entered, though only at the top of spring tides.

The channel is buoyed, but it is necessary to take a pilot, and the space is so confined and tortuous that a long ship has considerable difficulty in making the necessary turn. A large per-centage of vessels entering the port, small as well as large, constantly run aground from these causes, or from trying to enter at an improper time of tide, or neglecting to take a pilot. Such accidents, however, are seldom attended with more than delay and inconvenience, as the shoalest and most intricate part of the passage is sheltered. When within, the port is perfectly landlocked, and vessels may lie in from 14 to 18 ft. at low water, but the harbour accommodation is limited.

Black buoys mark the southern side of the entrance, and *red* buoys the northern side. The buoys marking the northern edge of the shoal extending from Shoal Point, and Channel Rock (lying half a cable S.W. of Pelly Island), are of pyramidal shape, surmounted by a ball.

Light.—On *Berow Island*, on the West side of the entrance to the harbour, is a white tower, 30 ft. high, from which is shown a *fixed blue* light, elevated 44 ft. above high water, and visible 6 miles.

VICTORIA, the capital of Vancouver Island and British Columbia, is beautifully situated on the southern and eastern sides of Victoria Harbour, having a population variously estimated at between 6,000 and 8,000. A good road connects it with Esquimalt, $3\frac{1}{2}$ miles distant. It is the centre of a considerable foreign and coasting trade, which will probably greatly increase on the completion of the trans-continental Canadian Pacific Railway. A line is also projected to run on the East side of the island from Esquimalt to Nanaimo, &c.,

VANCOUVER ISLAND.

which will greatly help to open up the interior. At present there is communication by steamer with British Columbia, Puget Sound, Columbia River, San Francisco, &c. A telegraph cable crosses the Strait of Fuca to Port Townsend, thus connecting with the United States telegraph system, and another line communicates with Nanaimo, British Columbia, Canada, &c.

There is a depth of 14 to 16 ft. at low water off the wharves in front of the city, alongside which vessels may heave down. On the opposite side of the harbour is a small slip, suitable for vessels up to 200 tons. Good provisions can be procured here at moderate prices, and water can be supplied from a floating tank to vessels inside or outside the harbour. There is an iron foundry here, where repairs to machinery can be effected; castings up to about 3 tons can also be undertaken. Coal is plentiful and cheap.

Anchorage.—Vessels anchoring outside the harbour to wait for the tide, or from other causes, should not come within a line between Ogden and MacLaughlin Points, the former bearing W. $\frac{1}{2}$ N., the latter E. $\frac{1}{2}$ S., midway between, or a quarter of a mile in either. This is a good stopping place with off-shore winds or fine weather, but is by no means recommended as a safe anchorage for sailing vessels during the winter months, when bad weather may be looked for with little warning.

There are three or four pilots attached to the port, who keep a good look-out for vessels off the entrance. Pilotage is compulsory to all merchant vessels, except coasters, but the charges are moderate.

Brochey Ledge.—About 4 cables from Holland Point, and right in the fairway of vessels entering Victoria Harbour from the eastward, lies Brochey Ledge, with 5 ft. on its shoalest part; it is covered with kelp, and about a cable in extent within the 5-fathoms line. There is 9 fathoms between the ledge and the shore. A conical bell buoy, painted red, is moored $1\frac{1}{2}$ cable S.W. of the shoal spot of 5 ft. The buoy is liable to be occasionally washed away during the heavy winter gales.

Fisgard Island lighthouse, the North part of Brothers Island, and Macaulay Point in line W. $\frac{1}{2}$ N., leads a cable North of the ledge in 9 fathoms, between it and the shore; and the lighthouse, just open southward of Brothers Island W. by N. $\frac{1}{2}$ N., leads 2 cables South of the ledge in 21 fathoms.

In entering or leaving Victoria Harbour, keep either of the above marks on, till the lighthouse on Berens Island bears about N.N.W., when a vessel will be clear of the ledge. Coasters, and those acquainted with the place, usually go North of it.

The COAST from Victoria Harbour trends in an easterly direction for 2 miles to Clover Point, and is for the most part faced by white sandy cliffs, varying in height from 10 to 80 ft.; a sandy beach extends along the whole way, and at a cable's distance off in many places are rocks and foul ground. At 2 cables East of Holland Point, and a cable off shore, are *Glimpse Reefs*, which cover at three-quarters flood, and have 7 fathoms just outside them.

Beacon Hill, a gentle rise of the land, 2 cables from the water's edge, and a mile East of the harbour, is grassy and bare of trees; its height is 140 ft., and there is a staff or beacon on the summit. Here there is a race course. *Clover Point*, at 2 miles eastward of the entrance to Victoria Harbour, is low, bare of trees, and projecting; it is steep-to, and off it are some strong tide-rips, dangerous to boats in heavy weather. *Ross Bay*, to the eastward of it, is open, but sometimes used by small craft if waiting for the tide, there being from 4 to 5 fathoms at 2 cables distance off shore. *Foul Bay*, nearly a mile N.E. of Clover Point, is of small extent, and filled with rocks. Off its entrance are *Templar Rocks*, about 4 ft. under water, and marked by kelp. At the back of Foul Point, the eastern point, is *Gonzales Hill*, 230 ft. high.

Trial Islands, nearly $1\frac{1}{2}$ mile eastward from Clover Point, on the South side of Enterprize Channel, are two in number, bare and rocky, but generally appear as one. The southern and largest is 80 ft. high. Strong tide ripples prevail off the southern island, especially during the flood, which runs nearly 6 knots at springs just outside it.

Enterprize Channel, between Trial Islands and the Vancouver shore, is a narrow, tortuous, but deep channel, much used by steamers and coasters trading to Victoria Harbour, as a slight saving of distance is effected, and less tide experienced than by going South of Trial Islands. Its length is about a mile, with 4 fathoms least water. *McNeil Bay*, on the North side of the channel eastward of Foul Point, is upwards of 3 cables in extent, with from 2 to 6 fathoms water. It is open to the southward, and is used by small vessels waiting for the tide. *Mouatt Reef*, in the eastern part of the channel, 3 cables from Trial Island, and nearly 2 cables off shore, is about a cable in extent, and covers at a quarter flood. This rock is dangerous for vessels using Enterprize Channel, as it lies just North of the fairway.

Brodie Reef, with 3 fathoms least water, lies nearly a mile N.E. $\frac{1}{4}$ N. from the summit of Trial Island, and should be carefully avoided by vessels using Enterprize or Mayor Channels.

GONZALES POINT, forming the S.E. extremity of Vancouver Island, is a low salient point, rocky, bare of trees, and steep-to on the East side. From hence to Cadboro Bay the shore is low, with dwarf oak and pine trees.

Oak Bay.—From Gonzales Point the Vancouver shore trends to the northward, and at a mile from the point forms a sandy bay, which is somewhat less than a mile in extent, and affords fair anchorage near its North part in from 3 to 4 fathoms. The best anchorage is northward of Mary Todd Islet, lying in the South part of the bay.

CADBORO BAY, $2\frac{1}{2}$ miles to the northward of Gonzales Point, is about half a mile in extent, and open to the S.E.; no sea, however, rises within it, and there is good anchorage in from 3 to 4 fathoms near the entrance.

Mayor Channel, to the northward of Gonzales Point, and West of Chain North Pacific.

Islets, is about 2 miles long in a winding direction to the northward; its breadth in the narrowest part is 3 cables, and the soundings in it vary from 9 to 13 fathoms. The channel is bounded on the West side by Thames Shoal and Fiddle Reef, and abreast the latter on its opposite side lies Lewis Reef. The tide seldom runs more than 3 knots through this channel, and it is the one generally used. *Thames Shoal*, of 2 fathoms water, is of small extent, and marked by kelp; it lies nearly half a mile N. by E. from Gonzales Point, at the S.W. part of Mayor Channel. Channel Point in line with the West side of Great Chain Islet, N. by E. $\frac{1}{2}$ E., leads a cable East of this shoal, and the highest part of Trial Island in line with Gonzales Point, S. $\frac{3}{4}$ W., leads half a cable West of it.

Lee Rock, which only uncovers at low water springs, lies $1\frac{1}{2}$ cable westward of Thames Shoal. It is marked by kelp, and is steep-to on the East side. Between this rock and Thames Shoal is *Mouatt Channel*, a cable wide, with from 7 to 9 fathoms. The highest part of Trial Island in line with Gonzales Point, S. $\frac{3}{4}$ W., leads midway between Thames Shoal and Lee Rock, and also through the fairway of the North part of Mayor Channel, between Fiddle and Lewis Reefs.

Fiddle Reef, at the N.W. extreme of Mayor Channel, and upwards of a mile from Gonzales Point, is of small extent, and awash at high water spring tides. It may be approached close-to on the East side.

Todd Rock, at 2 cables West of Fiddle Reef, in the entrance to Oak Bay, covers at two-thirds flood, and is marked by kelp.

Lewis Reef, at the N.E. part of Mayor Channel, nearly 3 cables S.E. of Fiddle Reef, and 2 cables West of Chain Islets, covers at high water, and may be approached close-to on the West side. The passage between it and Chain Islets is filled with kelp, but has not less than 2 fathoms.

CHAIN ISLETS, midway between Discovery Island and the Vancouver shore, are a bare rocky group, three-quarters of a mile long in a westerly direction, and half a mile wide. *Spencer Ledge*, off their East side, at a distance of 2 cables from the easternmost high-water rock, is marked by kelp, and has 9 ft. on its shoalest part; if going through Hecate Passage it requires to be guarded against. Cadboro Point, open West of Channel Point, N.W. by N. $\frac{1}{2}$ N., leads a cable East of this ledge through Hecate Passage.

Caroline Reef, at the North part of the group, and connected to it by a rocky ledge, is of small extent, and covers at a quarter flood, but is well out of the track of vessels using any of the channels. Foul ground, with from 3 to 4 fathoms, and marked by kelp, exists upwards of a cable West of it.

DISCOVERY and CHATHAM ISLANDS.—Discovery Island is 2 miles N.E. of Gonzales Point, at the junction of the Haro and Fuca Straits. It is wooded, about three-quarters of a mile in extent, and its shores on all sides are bordered by rocks. *Rudlin Bay*, on its S.E. side, is filled with rocks, and should not be used by any vessel.

Chatham Islands, to the N.W. of Discovery Island, and separated from it by a narrow boat pass, are of small extent, forming an irregular group, low and wooded, the tide rushing with great strength through the narrow passages between them. *Leading Point*, at the South extreme, is a bare rocky islet at high water. *Channel Point*, their West extreme, is also bare and steep-to; the tide runs strong past it. *Strong Tide Islet*, the N.W. of these islands, is rocky, about 50 ft. high, and wooded; its West side forms the eastern boundary of Baynes Channel, and is steep-to. The ebb tide runs very strongly past it, nearly 6 knots at springs. *Refuge Cove*, on the East side of Chatham Islands, is small, and has $1\frac{1}{2}$ fathom in the centre; coasters or small craft entangled among these islets may find shelter in it. *Alpha Islet*, the easternmost of the group, is bare, and 10 ft. above high water.

Fulford Reef, 3 cables North of Chatham Islands, is about a cable in extent, and covers at three-quarters flood. Vessels using Baynes Channel should keep well to the westward to avoid this reef, as the tide sets irregularly in its vicinity.

Hecate and Plumper Passages.—Discovery Island is separated from Chain Islets by a passage half a mile wide in the narrowest part, forming an apparently clear and wide channel, but near the middle of the South part lies *Centre Rock*, which has only 3 ft. over it, and, though marked by kelp, this, from the strength of the tides, is often run under, and seldom seen. There is a deep passage on either side of this danger, the one to the westward being called Hecate, and the eastern one Plumper Passage. The latter is wider, and best adapted for large steamers, but the tide sets very strongly through both of them. Cadboro Point well shut in North of Leading Point, N.W. $\frac{3}{4}$ N., leads through Plumper Passage in mid-channel, East of Centre Rock.

Baynes Channel, between Cadboro Point and Chatham Islands, connecting these inner channels with Haro Strait, is upwards of a mile long, and half a mile wide. The soundings in it are irregular, varying from $4\frac{1}{2}$ to 30 fathoms, and the tide at springs rushes through it with great velocity, strongest along the eastern side.

Five-fathoms Shoal, lying in the centre of the channel, is not marked by kelp. On its northern side is a patch of $4\frac{1}{2}$ fathoms, near which a shallow patch of $16\frac{1}{2}$ ft., about 83 yards in extent, North and South, was found in 1880. If wishing to avoid these shoals, a vessel has only to keep a little over on either side of mid-channel.

CADBORO POINT, on the Vancouver shore, at the termination of the inner channels, is nearly 3 miles North of Gonzales Point, and three-quarters of a mile West of Chatham Islands. It is about 50 ft. high, rocky, and bare of trees. A small islet lies just off it, also a reef which covers. In passing, do not approach the islet within 2 cables.

The coast West of Cadboro Point to Cadboro Bay is low, very much broken, and there are some off-lying rocks. *Jemmy Jones Islet*, which is bare,

and 15 ft. above high water, lies 3 cables off shore, midway between the two points.

None of these inner channels, though deep, should be used except by steamers of moderate size, or small craft, unless in cases of necessity. Coasters and small steamers, when taking advantage of them, generally proceed through Mayor Channel. The Hecate and Plumper Passages are nearly straight, and better adapted for large steamers than those West of Chain Islets.

Tides.—The high water, on full and change, is irregular, and much influenced by prevailing winds; the greatest rise and fall of tide at Discovery Island is 12 ft. During summer months the flood stream in these channels commences at 11^h 15^m a.m., running with great strength till nearly 3 p.m., after which but little tide is felt till 4 a.m. on the following day, when the ebb commences and runs strong till nearly 11 a.m., the time of low water by the shore.

CONSTANCE BANK, lying in Juan de Fuca Strait, nearly 6 miles S.E. by E. $\frac{1}{2}$ E. from Fisgard Island lighthouse, 3 miles S. by W. from Trial Island, and 7 miles N.E. from Race Island lighthouse, is upwards of a mile in extent, with 9 to 14 fathoms, but a vessel should not anchor on it, as the bottom is rocky.

Fonte' Bank, about a mile in extent, with from 3 $\frac{1}{2}$ to 5 fathoms, and marked by kelp, lies nearly in the middle of Juan de Fuca Strait, 6 miles S. $\frac{1}{2}$ W. from Cattle Point, San Juan Island, 8 miles E. by S. from Discovery Island, and 8 miles W. $\frac{1}{2}$ S. from Smith or Blunt Island lighthouse. This bank ought to be avoided, as there may be less water on it than was found.

HARO STRAIT has been described on pages 364—381. We now proceed with the Western Coast of Vancouver Island, commencing with the coast beyond Port San Juan, described on page 393.

The WESTERN COAST of Vancouver Island is comprised between Bonilla Point, at the entrance of Juan de Fuca Strait, and Cape Scott, the N.W. extreme of the island, a distance of upwards of 200 miles. Its general direction is W.N.W. and E.S.E., but the coast is broken into deep inlets, the principal of which—Barelay, Clayoquot, Nootka, Esperanza, Kyuquot, and Quatsino Sounds—are large sheets of water, with features similar to the other great inlets on this part of the American continent.

Making the Land.—When first making the land, an unbroken range of mountains will be seen; on a nearer approach it appears thickly wooded, and apparently fertile, intersected with many deep openings and valleys, which in most cases are some of the inlets before mentioned. The coast is generally low and rocky, but rises immediately to mountains of considerable height. It is fringed by numerous rocks and hidden dangers, especially near the entrances

of the sounds, and the exercise of great caution and vigilance will be necessary on the part of the navigator to avoid them, even with the present large scale charts. On no occasion, therefore, except where otherwise stated in the following pages, should a stranger attempt to enter any of the harbours or anchorages during night or thick weather, but rather keep a good offing until circumstances are favourable; and when about to make the coast, it cannot be too strongly impressed upon the mariner to take every opportunity of ascertaining his vessel's position by astronomical observations, as fogs and thick weather come on very suddenly at all times of the year, more especially in the summer and autumn months.

Tides.—All along the outer or West coast of Vancouver Island it may be said to be high water at full and change when the moon crosses the meridian, viz., at noon and midnight, the tide showing considerable regularity as compared with the inner waters, the greatest rise and fall being everywhere about ft. There are two high and low waters in the 24 hours all the year round. In summer months the superior high water is at midnight, and in winter months at noon.

The flood stream appears to set along the coast to the N.W., and the ebb to the S.E.; neither is of great strength, except in the vicinity of Fuca Strait and Scott Islands. In the summer months a set is generally found to the southward, and in winter in the opposite direction, but the currents are irregular, and influenced by prevailing winds.

Soundings.—At the entrance of Juan de Fuca Strait the 100-fathoms edge of the bank extends upwards of 30 miles off shore; it then runs nearly straight in a N.W. by W. direction, gradually nearing the coast, and abreast Cape Cook or Woody Point the depth of 100 fathoms will be obtained within 4 miles of the shore; to the N.W. of Woody Point the 100-fathoms edge does not extend more than 10 miles off shore, and to the southward and westward of Scott Islands even less.

The nature of the bottom, when under 100 fathoms, appears to be generally composed of sand and gravel, and does not differ in one part from another sufficiently to afford any guide for ascertaining a vessel's exact position on the coast; the bank, however, extends far enough off shore to the S.E. of Cape Cook, that if running for the coast in thick weather, the mariner, by sounding in time, will get due notice of his approach to the land, as the edge of 100 fathoms does not come within 18 miles of it, and the bank shoals very gradually.

The Coast from Port San Juan runs 10 miles in a westerly direction to Bonilla Point, rising gradually to elevations from 1,000 to 2,000 ft.; it is rocky and bluff, and the land is thickly wooded. *Bonilla Point*, the North entrance point of Fuca Strait, is $12\frac{1}{2}$ miles N.N.W. of Cape Flattery; the point slopes gradually to the sea, is not in any way remarkable, and may be approached within 1 mile.

Nitinat Lake, the entrance to which is narrow and shoal, is 7 miles westward of Bonilla Point. The lake is of considerable size, extending to the northward and eastward. There is only 1 to 2 fathoms in the entrance, and the sea generally breaks heavily across it in bad weather. Four miles to the westward of the entrance is a remarkable waterfall, called by the natives *Tsusiut*, which may be seen at a good distance, even in thick weather, when it would help to identify a vessel's position, being the only waterfall on this part of the coast.

Pachena Bay, 20 miles westward of Bonilla Point, is nearly 2 miles deep in a northerly direction, and half a mile wide, with from 5 to 6 fathoms water, but as it is open to the southward and S.W., and there is usually a heavy swell setting into it, no vessel should anchor there. Off the entrance is *Seabird Islet*, 10 ft. high.

The coast between Pachena Bay and Beale Point, the S.E. point of entrance of Barclay Sound, a distance of 3 miles, is rocky, forming an open bay which affords no shelter.

BARCLAY SOUND* is an extensive arm of the sea, 30 miles westward of the entrance of Juan de Fuca Strait. It is upwards of 14 miles wide at the entrance, and though encumbered by numerous islands it maintains this breadth for nearly 12 miles inland, when it separates into several narrow inlets or canals, the principal of which, the Alberni Inlet, extends 23 miles in a northerly direction, its head reaching within 14 miles of the eastern or inner coast of Vancouver Island. Off the entrance, and in the southern parts of the sound, are innumerable rocks and islands, with several navigable channels between them, which, however, ought to be used with great caution by a stranger, who should not attempt to enter at night. The shores are low, except in the northern part and among the canals, when they become high, rugged, and mountainous.

It is high water in Barclay Sound, on full and change, at 12^h, and the rise and fall of tide is about 12 feet.

A bank of sand and gravel, with depths from 25 to 45 fathoms, extends 20 or 25 miles to the southward and westward of the entrance of Barclay Sound. In the middle of this bank there is a deep hole, the East part of which is 5 miles S.W. from the entrance; from thence the hole extends 19 miles in a W.S.W. direction, with depths varying from 60 to 100 fathoms. This bank and hole are useful for ascertaining a vessel's position in thick weather.

There are three navigable ship channels into Barclay Sound, viz., the

* Barclay Sound, as it is now spelt, at the head of which the Alberni Settlement is placed, should properly, I believe, be "Berkely," as it was named by Captain Berkely, of the ship *Imperial Eagle*, who in 1787 discovered, or rather rediscovered, the Strait of Fuca.
—Capt. R. G. Mayne.

Eastern, Middle, and Western, and all require great caution in navigating; they will be described in their regular order.

The Eastern Channel, on the eastern side of Barclay Sound, between the main shore and Deer Islands, is 12 miles long in a N.N.E. direction, and its breadth varies from 1 to $1\frac{1}{2}$ mile. Its shores are low and rugged, except in the North part, which becomes high. The soundings in the entrance vary from 18 to 22 fathoms, increasing gradually to 90 and 100 fathoms at the North part. There are several dangers within it, the rocks off Cape Beale and Channel Rocks at the southern part, and Fog Rock off the East side of Tzaartoo Island.

CAPE BEALE is the S.E. point of entrance of Barclay Sound, and of the Eastern Channel; its lighthouse is $30\frac{1}{2}$ miles N.W. by W. $\frac{1}{2}$ W. from Cape Flattery lighthouse. It is a bold rocky point, 120 ft. high, and some rocks extend off it, from 2 to 4 cables.

The LIGHTHOUSE on Cape Beale is a square tower, about 40 ft. high, and painted light stone colour; from it is shown a *revolving bright* light every half minute, elevated 164 ft., and visible 19 miles. Lat. $48^{\circ} 47' 30''$ N., long. $125^{\circ} 12' 50''$ W.

At night the light should not be brought to bear to the eastward of E. $\frac{1}{2}$ N., to avoid the dangers off the entrances to the sound. To the northward of East the light becomes obscured.

Bamfield Creek, 4 miles from Cape Beale, on the East side of the channel, runs in $1\frac{1}{2}$ mile in a southerly direction; there is room for a vessel to moor at a short distance from its head in 6 fathoms. **Grappler Creek** extends from the entrance of Bamfield Creek two-thirds of a mile to the eastward. **Kelp Bay**, $5\frac{1}{2}$ miles from Cape Beale, is two-thirds of a mile wide, a quarter of a mile deep, and affords a fairly-sheltered anchorage in 6 to 14 fathoms.

Mark Islet, 8 miles from Cape Beale, and 1 cable off the East side of the channel, is small and wooded, and conspicuous from the entrance of the Middle Channel.

Numukamis Bay, 9 miles from Cape Beale, at the N.E. part of the Eastern Channel, is of an oblong shape, 3 miles wide and $1\frac{1}{2}$ mile deep; its shores rise gradually to mountains from 1,000 to 2,000 ft. high. In the centre of the bay are the *San José and Reef Islets*, of small extent and low.

Poett Nook, in the South part of this bay, about 1 mile within its S.W. point, is a landlocked basin, about 3 cables long and 2 cables wide, with 7 fathoms water.

Turn Island, at the N.E. point of the Eastern Channel, and dividing it from the Alberni Channel, is small and wooded, and separated by a narrow boat pass from the East shore.

Ship Islet, at the S.W. point of the Eastern Channel, N.W. $\frac{1}{2}$ N., 2 miles from Cape Beale, is 100 ft. high and rocky, with a few remarkable trees on its northern part, which at some distance seaward give the islet the appearance of

a ship under sail, and form a good mark for identifying the channel. There is from 23 to 24 fathoms at 2 cables distance from it.

DEER ISLANDS form the western boundary of the Eastern Channel, and run N.N.E. and S.S.W. for 10 miles, with a breadth varying from 1 to 2 miles. They are low and of inconsiderable size, except the northern one, which is 1,000 ft. high in parts, and of considerable extent. There is only one navigable passage through them, the Satellite Pass, between Helby and Hill Islands.

King Island, the southernmost of these islands, is about 1 mile long and half a mile broad. Its shores are very rugged and broken, with rocks extending from 1 to 2 cables off.

Channel Rocks, on the West side of the channel, 3 cables East of King Island, and 1 mile E.N.E. from Ship Islet, are about 1 cable in extent, and cover at half flood. There is 10 to 12 fathoms at the distance of a cable to the eastward of them, and the sea generally breaks over them. They must be carefully avoided.

Diana Island, separated from King Island by a passage full of rocks, is of triangular shape, about $1\frac{1}{2}$ mile wide, and three-quarters of a mile broad. Its shores are rocky, and at a distance of 2 cables from its East side is *Todd Rock*, awash at high water, with 16 fathoms close to it.

Helby Island, the next island northward of Diana, has off its North side a small, but well sheltered, anchorage, in from 6 to 9 fathoms, easy of access from either the Eastern or Middle Channels, and very convenient as a stopping-place for vessels entering or leaving Barclay Sound. This is known as *Entrance Anchorage*.

Hill Island, two-thirds of a mile North of Helby Island, and separated from it by Satellite Pass, is small, with a summit of moderate height at its southern end. At a quarter of a mile South of it is a patch of $3\frac{1}{2}$ fathoms water, marked by kelp, and there are several small islets and rocks off its East and West sides.

Robbers Island, separated from Hill Island by a passage full of rocks, is 2 miles long and 1 mile broad at its widest part. It is low and steep-to on the eastern side, and between it and Tzaartoos Island is a small landlocked basin of 5 to 7 fathoms water, but almost inaccessible.

Tzaartoos or Copper Island, the northernmost of the Deer Islands, is $4\frac{1}{2}$ miles long in a N.N.E. direction, and $1\frac{1}{2}$ mile broad. It is higher than the other islands, rising in many parts to 800 and 1,000 ft.; its eastern side, except in the vicinity of Sproat Bay, is steep-to, and may be approached to 2 cables. Limestone of a fine quality is to be found in its northern part, and there are several indications of copper and iron ores.

Sproat Bay, on the East side of Tzaartoos Island, is about half a mile wide and 2 cables deep. In its centre are two small islets, and between them and the southern side of the bay a vessel may anchor in from 11 to 15 fathoms.

Leading Bluff, situated just South of the bay, is a steep point 400 ft. high, and conspicuous from the entrance of the Eastern Channel.

Fog Rock, lying about 2 cables East of Sproat Bay, is of small extent, with only 9 ft. over it, and steep to all round. This danger is in the track of vessels using Sproat Bay, and requires caution to avoid it, not being marked by kelp in the spring.

Nob Point, the S.W. entrance point of Alberni Inlet, and N.W. point of Eastern Channel, is about half a mile to the northward of Tzaartoo Island, and nearly 13 miles from Cape Beale. It is a remarkable cliff projecting point 476 ft. high, steep to on its South and East sides.

ALBERNI INLET, at the N.E. part of Barclay Sound, runs in a winding northerly direction for 22 miles, with a breadth varying from 2 cables to 1 mile, and terminates in a fine capacious anchorage at its head; the shores on either side are rocky and rugged, rising abruptly from the sea to mountains 2,000 and 3,000 ft. high; at the head, however, the land becomes low and fertile, a large quantity being fit for cultivation. A settlement and large saw-mills are established there, and quantities of the finest timber exported to different parts of the world. Several vessels have also been built here.

The soundings to within 1 mile of the head vary from 160 to 40 fathoms, the shores of the inlet are everywhere free from danger. The entrance between Nob Point and Turn Island lies at the termination of the Eastern Channel, lies 13 miles N.N.E. from Cape Beale.

San Mateo Bay, on the East side of the inlet, at $1\frac{1}{2}$ mile North of Turn Point, is three-quarters of a mile wide, and 1 mile deep. Its shores are high, and the soundings in it vary from 20 to 50 fathoms, being too deep for anchorage. *Mutine Point*, midway between this bay and Turn Island, is rocky, and, as at a short distance off it a rock is said to exist, a berth of 2 cables ought to be given in passing. Just South of this point is a small bay with irregular soundings from 11 to 17 fathoms, which might be used as a stopping-place.

Uchucklesit Harbour, on the West side of the inlet, 2 miles within Nob Point, is 3 miles long in a westerly direction, and its average breadth is about half a mile; the North shore is high, rising gradually to mountains of 2,000 and 3,000 ft., but the South shores and head are low; all are free from danger at the distance of a cable. The soundings vary from 20 to 40 fathoms, and there are two secure anchorages, Green Cove at the entrance, and Snug Basin at the head, with from 9 to 15 fathoms water. *Limestone* of very fine quality is to be procured at the head of the harbour, and *coal* has been found.

Green Cove, just within the entrance on the North side of the harbour, affords a snug, well-sheltered anchorage in 9 to 14 fathoms. Harbour Island, off its South side, and completely landlocking the anchorage in that direction, is of small extent, with a clear deep passage on either side into the anchorage. A

North Pacific.

rook lies half a cable off its S.E. point. This anchorage is convenient as a stopping-place for vessels bound to or from Stamp Harbour at the head of Alberni Inlet, and the entrances to it, on either side of Harbour Island, make it available to sailing vessels or steamers.

Steamer Passage, on the East side of Harbour Island, leads into Green Cove. It should only be used by steamers, or sailing ships with a fair wind. *Ship Passage*, which leads into Green Cove North of Harbour Island, is 4 cables long, and 2 cables wide, clear of danger, with from 11 to 20 fathoms, and available for sailing ships unable to enter or leave Green Cove by Steamer Passage.

On the North shore, 1 mile from Green Cove, is a large stream of fresh water, with a bank extending a short distance off it.

From Uchucklesit Harbour, the Alberni Inlet trends N.E. by E. for 3 miles, and is steep-to on both sides, after which it runs N. by W. to the head.

Nahmint Bay, on the West side of Alberni Inlet, 10 miles within its entrance, is about half a mile in extent, with from 19 to 20 fathoms water, and may be used as a stopping-place, if working down the inlet; a large stream disembogues at its head.

The *First Narrows*, 13 miles from the entrance to the inlet, are 3 cables wide at low water, steep-to on the West side, with 26 fathoms in mid-channel; if passing through them at high water, keep well over to the western shore.

The *Second Narrows*, 18 miles from the entrance, are 2 cables wide at low water, steep-to on the East side; the West side dries out 1 cable at low water. The depth in mid-channel is 40 fathoms; and in going through them a vessel ought to keep well over on the eastern side.

Stamp Harbour, at the head of Alberni Inlet, is a capacious and secure anchorage, 2 miles in length, and varying in breadth from 4 cables to 1 mile. Its western shore is high and rocky, but the eastern side and head are low and fertile, with a quantity of clear level land, almost fit for cultivation. A stream of considerable size, the *Sumass River*, flows into the harbour at the head, and is navigable for canoes several miles. It has its source in a chain of extensive lakes in the interior of Vancouver Island, and the quantity of water discharged from it is so great that there is a constant current out of the inlet, often exceeding 1 knot in strength.

An extensive saw-mill has been built on the East side of Stamp Harbour, and a small settlement formed, composed mostly of the workmen connected with the establishment. Great quantities of the finest timber in the world for spars are exported from this place, and vessels of considerable size may lie close to the saw-mill without grounding, as there is 4 fathoms almost alongside it. The anchorage in the harbour is in 8 to 12 fathoms, at the distance of three-quarters of a mile from the head, with Observatory Islet S.W. and the saw-mill North.

Observatory Islet, in the centre of the harbour, is a small bare rock about 6 ft. above high water. Some rocks extend half a cable North of it, but may be approached within 1 cable. It is in lat. $49^{\circ} 14' N.$, long. $124^{\circ} 50' W.$

Directions.—In entering Barclay Sound through the Eastern Channel, the S.E. entrance point, Cape Beale, may be easily recognized from the S.E., by its lighthouse and the islands West of it, Ship Islet being also very conspicuous from the trees on its North part. In approaching or rounding the cape, do not come nearer than half a mile to avoid the rocks off it, until Turn Island at the North part of Eastern Channel is well shut in by Leading Bluff, Tzaartoos Island, N. by E. $\frac{1}{2}$ E., when steer up the Eastern Channel with that mark on, which will lead clear of the rocks off the West side of Cape Beale, and East of Channel Rocks. When Ship Island bears W.S.W., the vessel will be well North of the latter, and may then steer up mid-channel about N.N.E.; on nearing Leading Bluff, keep the East side of Hill Island open South of it S.W. $\frac{1}{2}$ S., to pass East of Fog Rock, until the West side of Nob Point comes open East of Limestone Point N. $\frac{1}{2}$ W., when steer up within 2 cables of either shore, or in mid-channel. If bound to Stamp Harbour, after entering the Alberni Inlet, the only direction required is to keep mid-channel, and anchor on the eastern side of the harbour, with the bearings already given.

After entering the Alberni, a strong southerly wind will generally be experienced, blowing home to the head; it however usually falls a little during the night.

A steam-tug is attached to the saw-mill establishment, for the purpose of towing vessels through the Eastern Channel; when a vessel is expected the tug generally lies in Dodger Cove, at the entrance of Middle Channel, where a good look-out can be kept.

If beating into the Eastern Channel, which ought only to be done by small or quick working vessels, when standing towards Cape Beale, tack before the passage between Turn Island and the main comes open of Leading Bluff N.N.E. Ship Islet may be approached to a quarter of a mile; when nearing King Island, or Channel Rocks, tack when Turn Island comes shut in with Leading Bluff. As a rule, in standing towards the East shore do not come within 2 cables, and after passing Channel Rocks, keep outside of the line of Deer Islands. On nearing Leading Bluff and Fog Rock, keep Hill Island open of the former S.W. $\frac{1}{2}$ S. till Nob Point comes well open of Limestone Point N. $\frac{1}{2}$ W., which clears Fog Rock to the South and N.E. In standing into Numukamis Bay, give Reef and San José Islands a berth of about 2 cables, after which the shore on either side may be approached to about a cable, except near the centre of Numukamis Bay, which should not be approached closer than half a mile.

If necessary to anchor for the night, or from other causes, Entrance Anchorage in the Deer Group, just North of Helby Island, is recommended, being secure, and easy of access from either Eastern or Middle Channels. Kelp,

Sproat, and Nahmint Bays, also Green Cove, are easy of access, and may be used as stopping-places.

MIDDLE CHANNEL, the largest passage into Barclay Sound, is adjacent to the Eastern Channel, and separated from it by Deer Islands. It is upwards of 12 miles long in a N.N.E. direction, and 3 miles wide in the narrowest part, being bounded on either side by numerous small islands and rocks. The soundings within vary from 30 to 54 fathoms, and off its entrance are three dangers, named Western Reef, Channel Reef, and Danger Rock, which only break in heavy weather, and require great caution to avoid. Vessels will avoid them by night by keeping Cape Beale light in sight. In southerly or south-westerly gales there is generally a very heavy sea in this channel.

Danger Rock, in the S.E. part of the entrance of Middle Channel, is $3\frac{1}{2}$ miles W. $\frac{1}{4}$ N. from Cape Beale, and S.W. by W. $\frac{1}{4}$ W. $2\frac{1}{2}$ miles from Ship Islet; it is of small extent, and only breaks in heavy weather. There is from 22 to 40 fathoms at a distance of 2 cables around it. Swiss Boy Island just open West of Entrance Island, N.N.E., leads half a mile East of Danger Rock; Mark Islet open North of Ragged Island, N.E., leads the same distance West of it, and East of Channel Reef; and Sail Rock in sight West of Storm Island, N.W. by W. $\frac{1}{4}$ W., leads South of it and Channel Reef.

Channel Reef lies near the centre of the entrance of Middle Channel, $3\frac{1}{2}$ miles W. $\frac{3}{4}$ S. from Ship Islet, and $1\frac{1}{2}$ mile W.N.W. from Danger Rock. It is about a cable in extent, uncovers at low water, and has 27 fathoms close-to on the eastern side; there is from 19 to 50 fathoms in the channel between it and Danger Rock, and the same marks clear both of them.

Western Reef lies in the S.W. part of the entrance, $5\frac{1}{2}$ miles W. $\frac{3}{4}$ S. from Ship Islet, and 1 mile South of the Broken Group; it is about a cable in extent, awash at low water, and should not be approached within half a mile.

Entrance Island, the S.E. point of Middle Channel entrance, and nearly 1 mile W.N.W. from Ship Islet, is of small extent, and wooded. It is steep-to and cliffy on the South and West sides.

Hecate Passage, leading into Middle Channel between Entrance Island and Danger Rock, is 2 miles wide, with from 33 to 74 fathoms water, and is the best way to enter Middle Channel in thick weather, or from the South or East. **Shark Pass**, between Entrance and Ship Islands, is two-thirds of a mile wide, with from 14 to 25 fathoms in the middle, and may be used by steamers or sailing vessels with a fair wind.

Dodger Cove, on the East side of Middle Channel, between Diana and King Islands, is a narrow creek about two-thirds of a mile long and a cable wide, with several rocks and small islets off its entrance. It affords good shelter to coasters or small craft at its head, but it should not be attempted by a stranger.

Satellite Pass, 3 miles from Entrance Island, lies between Helby and Hill Islands, connecting the Eastern and Middle Channels. Its length is about a mile, and breadth half a mile; the soundings in the middle vary from 9 to 22

fathoms, and the South side is clear of danger, but 3 cables South of Hill Island, on the North side of the pass, is a shoal patch with $3\frac{1}{2}$ fathoms, marked by kelp. Leading Bluff open of the East side of Hill Island, N.E. by N., leads to the S.E. of this shoal.

A vessel bound to Alberni Inlet, after having entered Middle Channel, should proceed through this pass into the Eastern Channel, and on to the inlet through the latter, keeping about 1 or 2 cables North of Ragged, Helby, and Wizard Islands.

Village Rocks, lying on the East side of Middle Channel, 6 miles from Entrance Island, and one-third of a mile from the N.W. point of Robbers Island, are 2 cables in extent, nearly awash at low water, and usually break in heavy weather. They should not be approached within a quarter of a mile.

Chain Islands, on the East side of Middle Channel, are a chain of small islets and rocks nearly 4 miles long in a northerly direction. They run parallel to the West side of Tzaartoos Island, being separated from it by a passage three-quarters of a mile wide, but filled with rocks, and among which no vessel should enter.

Swiss Bay Island, the southernmost of this group, is small and clifty, and 2 cables West of it is *Bull Rock*, of small extent, with less than 2 fathoms water, which breaks in bad weather. A vessel ought not to approach the West side of these islands within half a mile, except when rounding their North part.

JUNCTION PASSAGE, at the N.E. part of Middle Channel, connecting it with the Alberni Inlet and Eastern Channel, lies North of the Chain and Tzaartoos Islands, between them and the main. It is 2 miles long in an easterly direction, about one-third of a mile wide, its shores are clear of danger, and the soundings in mid-channel vary from 50 to 84 fathoms. On the North side of the passage is *Rainy Bay*, about $1\frac{1}{2}$ mile in extent; but there are several rocks and small islets within it, the shores are rugged and broken and the water too deep to afford anchorage. Northward of this bay, and connected to it by a very narrow boat pass, is *Useless Inlet*, a large sheet of water with from 9 to 20 fathoms, which no vessel can enter.

BROKEN GROUP, which forms the boundary of Middle Channel along the West side, is composed of a number of small islets and rocks, covering a space upwards of 6 miles long and 4 miles wide. They are low, and the principal ones wooded, the largest being about a mile in extent; there are several passages through them, and a good anchorage, called Island Harbour, in their N.E. part, but as a rule no stranger should venture among them or approach within half a mile, as the soundings are irregular, and there may exist rocks besides those marked on the charts.

Redonda, the S.E. island of this group, lies at the S.W. entrance point of Middle Channel, $4\frac{1}{2}$ miles W. $\frac{1}{4}$ N. from Ship Islet. It is small, wooded, and of a round shape; some rocks extend 3 cables off its S.E. point, and half a

mile E.N.E. of it is a reef which covers at half-flood. Between Redonda Island and Channel Reef is a passage 1 mile wide, with from 19 to 33 fathoms, but it should not be attempted by a stranger.

Village Island, the largest of the group, is $1\frac{1}{2}$ mile North of Redonda, and upwards of a mile in extent; the East side is bold and cliffy. On its North side is a village of considerable size, where landing may be effected in almost all weathers.

Coaster Channel, which runs in a westerly direction through the Broken Group, North of Village Island, is about 4 miles long, and from half a mile to 1 mile wide, with from 10 to 24 fathoms; but as there are several rocks within it, this channel should not be attempted by a stranger.

Village Reef, in the East part of Coaster Channel, half a mile North of Village Island, is small, and 4 ft. above high water; there is 34 fathoms at 3 cables East of it.

Island Harbour, in the N.E. part of Broken Group, and 5 miles from the entrance of Middle Channel, is a good, well-sheltered anchorage, about half a mile in extent, with from 10 to 14 fathoms water; it is formed by several rocks and islands, and there are two good passages into it from the Middle Channel. *Protection Island*, off its East side, and protecting it in that direction, is two-thirds of a mile long, and narrow. *Elbow Islet*, 3 cables S.S.W. from Protection Island, is small and rugged, with a notch in the centre; the islet is conspicuous from the southward. *Elbow Rocks*, which cover at two-thirds flood, lie $1\frac{1}{2}$ cable N.N.E. of Elbow Islet, between it and Protection Island, and are steep-to on all sides. *Pinnacle Rock*, 3 cables East of Elbow Islet, almost in the fairway of the South entrance, only breaks in heavy weather, and is dangerous to vessels entering the harbour by that passage.

Island Harbour may be entered either by the South or by the Harbour Entrance. The South entrance, between Elbow Rocks and Protection Island, is $1\frac{1}{2}$ cable wide at its South part, with from 9 to 14 fathoms water. Harbour Entrance, along the North side of Protection Island, between it and Gibraltar Island, is nearly a mile long, and its breadth averages about 2 cables. The soundings within it vary from 15 to 18 fathoms, and in the middle, 4 cables from its East end, lies Channel Rock, of small extent, with only 9 ft. on it at low water.

The best anchorage is near the centre of the harbour, about 2 cables West of the N.W. end of Protection Island, in from 10 to 12 fathoms, protected by Puzzle and Mullins Islands from the westward.

No one should attempt to enter this harbour without the chart, unless thoroughly acquainted with the place; and it ought only to be entered by sailing vessels with a fair wind.

Nettle Island, the N.E. island of Broken Group, is nearly 1 mile in extent, steep-to off its North side, but East and West of it some islets and rocks extend out half a mile. At half a mile East of its East point is a small bare

rock 8 ft. above high water, named *Swale Rock*, which is very conspicuous from Middle Channel, and marks the East entrance of Seshart Channel.

SESHART CHANNEL is North of Broken Group between it and the main, and connects the Western and Middle Channels. It is a winding channel, 5 miles long in a westerly direction, and about half a mile wide; the soundings in it vary from 16 to 35 fathoms, and a mid-channel course through is free from danger.

Capstan Island, 3 miles from the East entrance, and nearly in the middle of this channel, is small, and the southernmost of a number of small islands, extending nearly 1 mile from the North shore. Westward of these islets is an extensive village, called *Seshart*, to the southward of which a vessel may anchor a quarter of a mile off shore.

Bird Islets are two small, bare, conspicuous rocks, lying almost in the centre of the North part of Middle Channel, 9 miles from the entrance; the southern islet is 35 ft., and the northern 30 ft., above high water.

Effingham Inlet, the entrance to which is in the N.W. part of Middle Channel, is narrow, and about 8 miles long in a curved direction to the N.W., terminating in a low swamp; its shores on both sides are high and rocky, the western one indented by several bays. The soundings in it vary from 35 to 70 fathoms, and there is no anchorage.

Vernon Bay, 1 mile East of Effingham Inlet, at the head of Middle Channel, is upwards of a mile in extent, open to the southward, and too deep to afford anchorage; its shores are high and rocky. At 3 cables off Palmer Point, its S.W. extreme, is a rock 3 ft. above high water.

The North shore of Middle Channel is rocky and bold, rising in some place to mountains upwards of 3,000 ft. high; it is steep-to, and clear of danger; in southerly winds the sea breaks violently along it.

DIRECTIONS.—Entering Barclay Sound by the Middle Channel with a fair wind, and coming from the West or S.W., keep well clear of the western part of the Sound, and 3 miles South of Broken Group. Steer towards Ship Islet on an E.N.E. bearing, until Mark Islet comes open North of Ragged Island N.E., when haul into the Middle Channel with that mark on, which will lead midway between Channel Reef and Danger Rock; when Ship Islet bears E. by N. the vessel will be clear North of them, and may then steer up mid-channel. If bound to Alberni Inlet, a sailing vessel ought to proceed through Satellite Pass into the Eastern Channel (as the wind is generally unsteady in Junction Passage), proceeding according to the directions given in page 411 for the latter channel. Should it, however, be requisite to go through Junction Passage, give Chain Islands a berth of nearly half a mile to avoid the rocks off them, and steer in mid-channel through the passage into Alberni Inlet.

Unless intending to go through Satellite Passage, do not approach Deer Islands within half a mile.

If entering Middle Channel from the eastward, or in thick weather, and not

able to see the marks for clearing the reefs, keep well out until Entrance Island bears North, when steer through Hecate Passage so as to pass 2 or 3 cables West of the island, which will lead well eastward of all danger, then proceed as before directed.

Beating into Middle Channel, when South of Danger Rock and Channel Reef, keep Sail Rock (which lies off the S.W. side of Broken Group, and is very conspicuous) open South of Storm Island, the southernmost of the group, N.W. by W. $\frac{1}{2}$ W., until Mark Islet comes nearly on with the S.E. point of Hill Island N.E. $\frac{1}{2}$ E., when, if standing to the westward, tack; in standing to the eastward, avoid shutting in the passage between Hill and Ragged Islands; tacking when these latter marks are on will lead between Danger and Channel Reefs, and clear of them. When Ship Islet bears East, a vessel will be northward of them, and may stand over to about half a mile from Deer Islands, and a mile from Broken Group. If bound to Alberni Inlet, when able to lay through Satellite Pass, do so, keeping nearer to its South shore, and beat up to the former through the Eastern Channel. No vessel should attempt to beat through Middle Channel unless the weather be clear, and the marks well made out.

WESTERN CHANNEL leads into Barclay Sound westward of Broken Group, between it and Great Bank. Its length is about 4 miles in a northerly direction, its breadth from 1 to 2 miles. *Sail Rock*, lying off the S.W. part of Broken Group, is a bare rock like a sail, rising 100 ft. above the sea, and very conspicuous. *Shag Rock*, 8 ft. above high water, on the East side of the channel, $2\frac{1}{2}$ miles N. $\frac{3}{4}$ W. from Sail Rock, and half a mile West of Broken Group, is small and bare, and foul ground exists 1 cable from it. *Round Island*, near the middle of the North part of the channel, is small, but 200 ft. high; it lies $3\frac{1}{4}$ miles N. by W. from Sail Rock.

Black Rock, at the S.W. entrance point of the Western Channel, $3\frac{1}{4}$ miles S.W. by W. $\frac{1}{2}$ W. from Sail Rock, is 10 ft. above high water, and small; some rocks, which break, extend 2 cables East of it.

Channel Rock lies at the S.E. extreme of Great Bank, on the West side of the channel. It is bare, 15 ft. above high water, and steep-to on its eastern side. *Great Bank* is, within the 10-fathoms edge, $2\frac{1}{2}$ miles long in a northerly direction, and its greatest breadth is $1\frac{1}{2}$ mile; on the shoalest parts, near the North and S.W. ends, there is from 3 to 4 fathoms, marked by kelp, over which in heavy gales the sea breaks.

Directions.—The Western Channel, though clear of danger and wide, ought only to be used by steamers, or sailing vessels with a fair wind, and not then unless bound to Toquart Harbour, in the north-western part of Barclay Sound. In entering, give Sail and Black Rocks a berth of half a mile, and steer up mid-channel, passing half a mile West of Round Island.

Peacock Channel runs through the N.W. part of Broken Group in a N.E. direction from the Western to Seshart Channel. It is about 3 miles long, and

nearly a mile wide, with from 20 to 30 fathoms; its West side is clear of danger, but on its East side, $1\frac{1}{2}$ mile within the West entrance, and 2 cables West of Puzzle Island, lies *Galley Rock*, which uncovers at low water, and has 22 fathoms 1 cable S.W. of it. This channel is fit for steamers, or sailing vessels with a fair wind.

Hand Island, the N.W. of Broken Group, and at the S.W. entrance point of Seshart Channel, is small and rugged; foul ground exists off its East and West sides, which should not be approached within 3 cables. *Liyall Point*, at the N.W. extreme of Seshart Channel, on the main, and a mile N.W. by N. from Hand Island, is a low sharp point.

Mayne Island, northward of Liyall Point, is of an oblong shape, 2 miles long, and 1 mile deep. Its shores, except near the North part, are low and steep-to, the soundings vary from 20 to 25 fathoms, and there is no anchorage except in its S.E. corner, where there is a limited spot with 14 fathoms about 2 cables off shore; the group of small islets, the *Sisters*, extending South 5 cables off the N.W. point, may be approached to a cable.

Stopper Islands, lying half a mile West of Mayne Bay, are about $1\frac{1}{2}$ mile in extent, wooded, and 200 ft. high; rocks extend from 2 to 3 cables off their East and West sides.

David Channel, leading into Toquart Harbour between Mayne Bay and Stopper Islands, is about 2 miles long in a northerly direction, 3 cables wide in its narrowest part, and the soundings in it vary from 17 to 22 fathoms. *Richard Rock*, on its West side, 4 cables from Stopper Islands, is steep-to on the East side, and may be approached to a cable's distance; a vessel should not go between this rock and the islands.

Toquart Harbour, in the N.W. corner of Barclay Sound, 9 miles from the entrance of Western Channel, is about $1\frac{1}{2}$ mile in extent, and well sheltered by Stopper Islands from all winds. The anchorage is of considerable extent, in from 12 to 14 fathoms, muddy bottom.

Village Passage leads into the harbour westward of Stopper Islands; it is upwards of a mile long, and clear in mid-channel.

Pipstem Inlet is a long narrow inlet, extending upwards of 5 miles nearly straight in a north-easterly direction from the N.E. part of Toquart Harbour. It has 19 to 37 fathoms water, but affords no anchorage whatever; its shores are rocky, and rise abruptly to 1,000 and 2,000 ft. above the sea; at its head is a small patch of swampy ground, some fresh-water streams flowing through it.

The West Coast of Barclay Sound, from Toquart Harbour to Ucluelet Arm, runs nearly straight, about S.S.W. and N.N.E., and rises gradually to high land over 2,000 ft. above the sea. For $2\frac{1}{2}$ miles from Stopper Islands a chain of small islands runs parallel to the coast at a distance of about three-quarters of a mile off, with from 5 to 7 fathoms between them and the shore. *Forbes*

North Pacific.

Island, the southernmost of them, is moderately high, and steep-to on its South side; nearly a mile S.W. from it, and extending from the opposite shore are a number of rocks above high water.

Ship Channel, between the Vancouver shore and Great Bank, southward of Forbes Island, leads into Ucluelet Arm, and is clear of danger. It is 4 miles long N.N.E. and S.S.W., two-thirds of a mile broad in its narrowest part, and the soundings vary from 26 to 38 fathoms. *Double Island*, at its S.E. point, is of small extent, steep-to on the West side, but from the South and East sides foul ground extends upwards of a mile. *Kelp Islet*, 6 cables N.W. of Double Island, on the opposite side of the channel, is low and bare; kelp extends 2 cables South of it, but there is a depth of 34 fathoms midway between it and Double Island.

Ugly Channel, to the eastward of Shelter Islands, connects Ship Channel with the ocean. It is bounded on both sides by rocks and reefs, and, though probably deep, it has not been sufficiently examined to recommend its being used by a stranger; the soundings in the North part vary from 28 to 36 fathoms. *Starlight Reefs*, at its S.E. part, are a cluster of rocks about 7 cables in extent, some above high water; in bad weather the sea breaks heavily over them.

Look-out Island, on the West side, is nearly bare, of small extent, and about 150 ft. high; at 3 cables South of it is a patch of rocks 2 cables in extent, and 6 cables North of it lies a bare rock, 6 ft. above high water.

UCLUELET ARM, just within the S.W. entrance point of Barclay Sound, is narrow, and extends $5\frac{1}{2}$ miles in a N.W. by W. direction, running parallel to the outer coast, and separated from it by a narrow peninsula. Its South shore is low, and indented by several small creeks and bays; the northern shore is nearly straight, and, at a short distance inland, rises gradually to a flat-top range of considerable height, the S.E. shoulder of which, *Mount Ozzard*, is 2,275 ft. high, and conspicuous from the S.E.

The soundings in this arm vary from 4 to 8 fathoms, and there is secure and well-sheltered anchorage from 1 mile inside the entrance to the head.

Shelter Islands, upwards of half a mile S.E. of the entrance of Ucluelet Arm, are an irregular cluster of small islets and rocks, about a mile long in a N.W. and S.E. direction, and 3 cables wide, which completely shelter the arm from the sea. *Centre Reef*, 3 cables westward of their northern part, is of small extent, and about 3 ft. above high water.

Carolina Channel, West of Centre Reef, between it and Amphitrite Point, the S.W. point of entrance to Barclay Sound, is the westernmost passage into the latter and Ucluelet Arm. This channel appears to be the best for a stranger to use if entering Ucluelet Arm from seaward.

Leading Point, on the South side of Ucluelet Arm, 6 cables within the entrance, is bold and steep-to, and here the breadth of the arm contracts to a cable. *Stewart Bay*, on the North side, half a mile within the entrance, is 2

cables deep, and half a mile wide. In its centre is a rock, awash at high water, and the bay is too shallow to afford anchorage. There is a native village of considerable size in its West part. *Channel Islet*, in the middle of the arm, about 2 miles within the entrance, and a mile past *Leading Point*, is small; between it and the latter is good anchorage in from 6 to 9 fathoms. To the westward of *Channel Islet* the arm becomes wider, affording good anchorage in 4 to 7 fathoms, over a space 1 mile long, and half a mile wide.

There are several channels leading into *Uclucet Arm*, with apparently deep water through them, but there are so many rocks and dangers in their vicinity, that even with the chart great vigilance on the part of a stranger is recommended, and it would hardly be advisable to enter without a pilot.

The Coast from *Amphitrite Point* takes a W. by N. direction for 17 miles to *Point Cox*. It is low, and indented by two large sandy bays, which afford no shelter. *Wreck Bay*, 4 miles westward of *Amphitrite Point*, is nearly 3 miles wide, and 1 mile deep. It is totally unfit for anchorage. A Peruvian vessel, the *Florentia*, was wrecked here in December, 1860, and the island, lying off the centre of the bay, was named after her.

Long Bay, 8 miles westward of *Amphitrite Point*, is 7 miles wide, and upwards of a mile deep, with from 8 to 11 fathoms between the entrance points. There are several rocks and shoal water within it, and no vessel ought to anchor here. *Schooner Cove*, in the N.W. part of the bay, would afford good shelter to a small vessel.

Portland Point, the N.W. extreme of *Long Bay*, is high and abrupt, with some small rocks and islets around it, at a distance of half a mile. *Gowlland Rocks*, $1\frac{1}{2}$ mile W.S.W. from it, are of small extent, bare, and from 10 to 15 ft. above high water. They ought not to be approached nearer than a mile.

CLAYOQUOT SOUND comprises a number of inlets, islands, and rocks, covering an area 30 miles long in a westerly direction, and 16 miles broad. The entrance to it is fringed by numerous dangerous rocks, which require due caution to avoid; it lies between *Cox* and *Sharp Points*, bearing from each other W. by N. $\frac{3}{4}$ N. 21 miles, and is distant 20 miles W. by N. from *Barclay Sound*, and 66 miles W.N.W. from *Cape Flattery lighthouse*. There are several channels into the inner waters of this sound, but, with the exception of *Ship Channel*, they ought not to be attempted by a stranger.

It is high water in *Clayoquot Sound*, on full and change, at 12^h, the rise and fall being about 12 ft.

POINT COX, at the S.E. extreme of *Clayoquot Sound*, is rocky, and may be approached to half a mile. A remarkable summit, *Vargas Cone*, 438 feet high, rises just within the point, and is very conspicuous from the westward.

Templar Channel, the eastern entrance of the sound between *Low Peninsula* on the East, and *Leonard, Wakenenish, and Stubbs Islands* on the West, is a winding passage about 4 miles long, in a N.N.W. direction, with an average breadth of half a mile. No vessel drawing more than 12 ft. water ought to

attempt to enter this sound by this channel, and not even then without a pilot, as it is very intricate, and no directions can be given. In heavy weather the sea breaks right across.

Broken Channel, between Wakenenish and Vargas Islands, to the westward of the former, is upwards of 2 miles long in a northerly direction, and half a mile wide in its narrowest part, with from 6 to 15 fathoms water. Several rocks lie off its entrance, and on both sides. The tide runs through from 2 to 5 knots, and no vessel ought to use it without a pilot. *McKay Reef*, lying off the entrance, 4 miles W. by N. from Cox Point, is of small extent, and 5 to 10 ft. above high water; the sea generally breaks heavily over it. Two-thirds of a mile North of this reef is *Passage Rock*, which covers at high water.

Vargas Island, on the West side of Broken Channel, is $4\frac{1}{2}$ miles long, $4\frac{1}{2}$ miles at its broadest part, and its surface is low and undulating. On the eastern side, near the middle, is a native village called *Kelsemart*; and at half a mile from the South shore, running parallel to it, is a chain of small islets and rocks, called the Rugged Group.

Ship Channel, to the westward of Vargas Island, between it and a number of small islands and rocks, is the only passage into Clayoquot Sound which ought to be attempted by a stranger. Its entrance lies nearly 11 miles westward of Cox Point, and the channel is 5 miles long in a N.N.E. direction, with a breadth varying from three-quarters to $1\frac{1}{2}$ mile. The soundings in the South part vary from 20 to 22 fathoms, decreasing to $5\frac{1}{2}$ fathoms in the shoalest part near the North end. The tide runs through it from 1 to 2 knots.

Bare Islet, at the S.E. entrance point of the channel, is small, rising to a summit 40 ft. high in the centre, and forms a good mark for identifying Ship Channel. A rock, which breaks, lies 5 cables E. by S. from it, but there is 20 fathoms within half a mile of its S.W. side. *Plover Reefs*, on the East side of the channel, half a mile N.W. of Bare Island, are of considerable extent, stretching 1 mile from the West side of Blunden Island, and some parts are 6 feet above high water. *Hobbs* and *Burgess Islets* lie at the N.E. part of the channel, 2 cables from the West side of Vargas Island, and nearly connected with it at low water.

Sea Otter Rock lies at the S.W. entrance point of Ship Channel, 2 miles W. by N. from Bare Islet; it is very small, and only 6 ft. above high water. *Shark Reefs*, some of which cover, others 6 ft. and 10 ft. above high water, lie on the West side, 2 miles N.E. by N. of Sea Otter Rock. They are about 3 cables in extent, and should not be approached nearer than 2 cables on their South and East sides.

Lawrence Islets, on the West side, nearly 3 miles from Sea Otter Rock, are small, low, and wooded. *Bartlett Island*, half a mile to the westward of Lawrence Islets, is low and wooded; its shores are much broken, and ought

not to be approached within half a mile. *Twins Islands*, at the N.W. part of Ship Channel, are low and wooded.

Hecate Passage, to the N.E. of, and connecting, Ship Channel with the inner waters of the sound, is 3 miles long in an E.N.E. direction between Vargas Island and the main shore of Vancouver, and upwards of a mile wide. There are several rocks on both its shores, and a sand-bank in its centre, but to the southward of the bank, along the North shore of Vargas, is a clear passage with not less than $5\frac{1}{2}$ fathoms.

Half-tide Rock, off the S.W. point of Hecate Passage, and 2 cables from Vargas Island, is of small extent, covers at half-flood, and may be approached to 1 cable on the outside.

Cat-face Mountains, rising on the main shore of Vancouver, and fronting the Ship Channel, are a remarkable flat-topped range, nearly 3,000 ft. high, with some patches of cliff and bare rock on their South side. They are very conspicuous from seaward.

Deep Pass, between two islands at the N.E. part of Hecate Passage, is about 3 cables long, and $1\frac{1}{2}$ cable wide, with 9 fathoms water, and is the best channel leading from Hecate Passage into the inner waters. The tide runs from 2 to 3 knots through it. **Hecate Bay**, 2 miles North of Deep Pass, on the West shore, is 6 cables wide and 3 cables deep, with from 9 to 10 fathoms. It is clear of danger, and one of the best anchorages within the sound, being easy of access, and well sheltered. There is a stream of fresh water in the middle of the bay, very convenient for watering. **Observatory Islet**, at its North point, is 35 ft. high, and bare. It is in lat. $49^{\circ} 15' 22''$ N., long. $125^{\circ} 56' 10''$ W.

Cypress Bay, on the main shore of Vancouver, and 4 miles North of Deep Pass, is nearly 2 miles in extent, with from 12 to 26 fathoms. There is good anchorage in 12 fathoms near its North part, at a distance of half a mile from the shore. It is open to the southward, but no sea rises. **Mussel Rock** lies 4 cables off the East shore of the bay, and half a mile N.W. by N. $\frac{1}{4}$ N. of the East extreme. It is of small extent, and covers at three-quarters flood.

Meares Island, within the eastern part of Clayoquot Sound, adjacent to, and N.E. of, Vargas Island, is 6 miles in extent in a northerly and 7 miles in an easterly direction. Its shores, except on the North side, are high and rugged, and there are several summits on the East and West sides upwards of 2,000 ft. above the sea; one on the latter side, named *Lone Cone*, is 2,331 ft. high, and very conspicuous from seaward near the entrance of Ship Channel. An extensive inlet runs nearly through the island from the South side to the North, and there are several other bights and bays.

Deception Channel, between Meares and Vargas Islands, is about 3 miles long North and South, and half a mile wide, with irregular soundings from 5 to 20 fathoms. The tide runs from 2 to 5 knots through this channel, and a stranger should not attempt its navigation.

Ritchie Bay, on the N.W. side of Meares Island, 2 miles eastward of Deep

Pass, is a mile wide, half a mile deep, and affords anchorage in $5\frac{1}{2}$ to 10 fathoms at 2 cables off its eastern shore. The shores of the bay are rocky, but have no outlying dangers.

If wishing to anchor in Ritchie Bay, and coming from Deep Pass, proceed to the eastward so as to pass about 1 cable North of Robert Point, and keeping the same distance off the South shore, steer into the bay, anchoring in 5 or 7 fathoms about 2 cables from its East side, with the extremes bearing North and S.W. $\frac{1}{2}$ W.; entering from the northward, steer midway between Saranac Island and the North point of the bay.

The North shore of Meares Island is low, nearly straight, and steep-to; it takes an E. by N. direction for nearly 4 miles, and then turns sharply to the S.E.

Bedwell Sound, the entrance to which is $1\frac{1}{2}$ mile West of Cypress Bay and northward of Meares Island, is 7 miles long in a northerly direction. The shores are high and rugged, rising on the East side to sharp jagged peaks from 2,000 to 4,300 ft. above the sea. *Race Narrows*, East of Bedwell Sound, between the North side of Meares Island and the main, are $1\frac{1}{2}$ mile long, and about 2 cables wide in the narrowest part. The tides run through them from 3 to 4 knots. *Warn Bay*, to the eastward of Race Narrows, and 1 mile from the N.E. part of Meares Island, is upwards of 2 miles long. The shores on both sides are high, but low at the head, from whence issue several streams, and a sand-bank dries out upwards of a cable.

Fortune Channel, between the East side of Meares Island and the main, is 5 miles long, North and South, and varies in breadth from 3 cables to $1\frac{1}{2}$ mile; its shores are high, and there are several off-lying rocks on its West side near the middle. The soundings vary from 30 to 75 fathoms.

Mosquito Harbour, on the East side of Meares Island, is narrow and about 2 miles long in a north-westerly direction. There are several rocks and small islets off its entrance, but it affords good anchorage inside in from 4 to 7 fathoms. The entrance is $1\frac{1}{2}$ cable wide, with 11 fathoms, and the harbour is well adapted for a steamer.

In entering Mosquito Harbour, round Plover Point at a cable's distance to avoid *Hankin Rock*, and keep midway between Wood Islands and the East shore, anchoring in about 7 fathoms, one-third of a mile South of Blackberry Islets. A vessel may enter westward of Wood Islets by keeping midway between them and the shore.

Dark Island, 7 cables South of Plover Point, on the West side of Fortune Channel, is small. Some rocks extend a short distance off its West side, but there is a clear passage between it and the West shore. *Double Island*, 5 cables South of Dark Island, is small and steep-to. There is 24 fathoms in the passage between it and Meares Island.

Deception Pass, at the South extreme of Fortune Channel, and connecting it with Tofiño Inlet and Browning Passage, is a winding channel to the S.S.E.

about $1\frac{1}{2}$ mile long and 2 cables wide. It is free from danger in mid-channel, and the tide sets with considerable strength through it.

TOFINO INLET, in the eastern part of Clayoquot Sound, is about 10 miles long in a northerly direction, and varies in breadth from one-half to $1\frac{1}{2}$ mile. Its shores are high and rocky, indented on the West side by some large creeks, and there is no anchorage, except near the entrance on the West side. *Indian Island*, on the South side of entrance, and half a mile S.E. from Deception Pass, is about a mile in extent, and steep-to on the North side.

Warn Island, nearly 1 mile North of Indian Island, off the West side of the inlet just within the entrance, is upwards of half a mile in extent, and steep-to on all sides. *Island Cove*, half a mile West of Warn Island, is of small extent, with from 8 to 10 fathoms in the middle, and completely landlocked. *Gunner Harbour*, on the West side of the inlet, just North of Warn Island, is $1\frac{1}{2}$ mile long in a N.N.W. direction, but narrow. The harbour becomes shoal towards the head. *Tranquil Creek*, on the West side of the inlet, and 4 miles North of Warn Island, is narrow, and upwards of a mile long. The creek is too deep for anchorage.

Flat-top Islets, 5 miles from the entrance of the inlet, and $2\frac{1}{2}$ cables from its West shore, are steep-to on the East side, there being 47 fathoms at a cable's distance from them. Northward of these islets the inlet takes a winding direction to the northward. On the East side of Tofino Inlet, 4 miles from the entrance, is a stream of considerable size, said to communicate with an extensive lake.

Browning Passage, on the South side of Meares Island, connecting Tofino Inlet with Templar Channel, is 5 miles long in a westerly direction, and less than half a mile broad. Its East end is only $1\frac{1}{2}$ cable wide; there are several rocks off the West entrance, and no stranger, except with a small vessel, should attempt it.

North Channel, to the westward of Ship Channel, and separated from it by a number of small islands and rocks, runs along the S.E. side of Flores Island in a north-easterly direction. It is 4 miles long, and half a mile wide in the narrowest part. Both sides of the channel are bordered by innumerable rocks, and it is not recommended for a stranger to use it. The sea generally breaks heavily along both sides of its outer part.

Flores Island, in the western part of Clayoquot Sound, between North Channel and Sydney Inlet, is nearly 7 miles in extent, and of a square shape. It is low on the South and East sides, but high on the North and West, rising in some places to 3,000 ft. The shores are rugged and broken, and there are several off-lying rocks along its South and West sides. As a rule its outer part ought not to be approached nearer than 2 miles. *Rafael Point*, the South extreme of Flores, is cliffy, and of moderate height. Some rocks extend 2 cables off it, and the point ought not to be rounded within half a mile. From thence the West coast of the island turns suddenly to the

N.N.W., and continues in that direction for 7 miles, being indented by several small bays.

Sydney Inlet, at the West end of Clayoquot Sound, is 10 miles long in a N.W. by N. direction, and varies in breadth from half a mile to 1 mile. Its entrance is $3\frac{1}{2}$ miles N.W. by N. from Rafael Point, between the West side of Flores Island and the main of Vancouver. At 4 miles from the head are two small branches about 2 miles in length, one extending North, the other S.W. The shores are high and rugged, rising abruptly from the sea to 2,000 and 3,000 ft. The depth in the entrance is 15 fathoms, increasing gradually towards the head, and there is no anchorage. *Sharp Point*, the S.W. point of entrance to Sydney Inlet and S.W. extreme of Clayoquot Sound, is low and rocky, and may be approached to a cable's distance.

Refuge Cove is just West of Sharp Point, and separated from Sydney Inlet by a narrow peninsula. It runs in $1\frac{1}{2}$ mile in a N.N.W. direction, is from 1 to 2 cables wide, and affords good anchorage in 4 to 5 fathoms at half a mile within the entrance, well sheltered and secure from all winds, though apparently open to the S.S.E.; the entrance, though narrow, is clear of danger, with the exception of a rock, with 7 ft. water, nearly 2 cables N.N.W. of Sharp Point. *Canoe Reef*, lying just S.W. of the entrance, and three-quarters of a mile westward of Sharp Point, is 2 ft. above high water, but steep-to on the South and West sides. A sailing vessel, if embayed near this part of the coast, would find safety and shelter in Refuge Cove. It can be entered by steering for Sharp Point, bearing N.W. by N. $\frac{1}{2}$ N.; pass a cable West of the point, and then keep close to the eastern shore, and anchor in about 5 fathoms, 7 or 8 cables within the entrance.

Shelter Arm branches off from the East side of Sydney Inlet to the N.E., along the North side of Flores Island for 5 miles, and then takes a N.E. by N. direction into the land for nearly the same distance, terminating in a narrow creek at the head. It is upwards of half a mile wide, 10 miles long, and the soundings vary from 40 to 90 fathoms in the South part. There is only one indifferent anchorage in it, just 2 miles within the entrance on the North side of Flores Island, in a small place named *Steamer Cove*. The shores of Shelter Arm are high, precipitous, and steep-to. The tide runs from 1 to 2 knots through it, the flood stream from the westward.

Obstruction Island, on the East side of Shelter Arm, and separated from the North point of Flores Island by a narrow pass, is about 2 miles in extent, and 700 ft. high. Its shores are rocky and broken. *Rocky Pass*, on its South side, is narrow, about $1\frac{1}{2}$ mile long, and filled with rocks, so that no vessel could get through it.

North Arm, between the East side of Flores Island and the main, is about 8 miles long in a S.E. by S. direction, and its breadth is nearly 1 mile. Its shores are high in the South part, but decrease gradually to the southward. A vessel may anchor in 5 to 8 fathoms abreast Base Point.

Matilda Cove, on the West side of North Arm, abreast the entrance to Herbert Arm, is a very narrow creek. $1\frac{1}{2}$ mile long in a S.S.E. direction, but useless as an anchorage. *Base Point*, the S.W. entrance point to North Arm, is low and sandy, and there is from 2 to 3 fathoms at a cable's distance from it.

Herbert Arm, the entrance to which is on the East side of North Arm, about 2 miles from the South entrance of the latter, is 9 miles long in a northerly direction, and its average breadth is about 1 mile. The shores are high, mountainous, and much broken; and there is no anchorage except at the South part of its entrance. *Cone Island*, lying at the entrance of this arm, is about 1 mile in extent, 1,000 ft. high, and steep-to on the South and West sides, but the passage into Herbert Arm North of it is blocked up by rocks and small islets. *Bawden Bay*, on the South side of entrance of Herbert Arm, and about $1\frac{1}{2}$ mile S.E. of Cone Island, is of small extent, and affords anchorage in 15 fathoms, near the centre; enter it in mid-channel. *White Pine Cove*, on the East side of Herbert Arm, nearly 3 miles from the entrance, is small, with a bank running off the head; a small vessel may anchor close to the edge of this bank in about 10 fathoms.

DIRECTIONS.—Entering Clayoquot Sound by Ship Channel (which latter will be easily recognised by Bare Islet, Sea Otter Rock, and a remarkable summit inland, the Lone Cone), round either Bare Islet or Sea Otter Rock at the distance of half a mile, and steer up the channel with the Twins Islands in line with the North summit of the Cat-face Mountains, bearing N.E. by N. $\frac{1}{2}$ N. Keep the above-mentioned mark on till within half a mile of Shark Reefs, when haul more to the eastward for the West extreme of Vargas Island, which may be rounded at a distance of 3 cables. If going on through Hecate Passage (page 421) into Hecate Bay, to clear Half-tide Rock keep Hobbs Islet open West of Burgess Islet S. by W. $\frac{1}{4}$ W. until the Twins come in line with the West Whaler Island W. by S., when steer up the passage with that mark on astern, which will lead North of Half-tide Rock and South of the North Bank. When past the latter, steer through Deep Pass, and anchor in Hecate Bay midway between its entrance points in 9 or 10 fathoms.

During heavy south-westerly gales the sea is said to break right across Ship Channel, between Lawrence and Hobbs Islands.

Although there are several apparently deep channels into Clayoquot Sound they are, with the exception of Ship Channel, so tortuous, and filled with rocks, that no stranger should attempt to enter by any except the latter. If intending to navigate the inner waters of the sound, which can only be done by a steamer or small craft, the chart will be found the best guide.

HESQUIAT HARBOUR, 8 miles westward of the West part of Clayoquot Sound, is formed at the bottom of the bay on the East side of Estevan Point. It is 4 miles long in a N.N.W. direction, and its breadth at the entrance is upwards of 2 miles, opening out a little inside, but on nearing the head it

North Pacific.

contracts to less than a mile. The soundings within the harbour vary from 4 to 9 fathoms, and there is a good secure anchorage in 7 or 8 fathoms at the distance of half a mile from the head. Across the entrance, between Hesquiat Bluff and Estevan Point, is a sort of bar or ledge, about 3 cables wide with 3 to 4 fathoms water over it, which in a great measure prevents the sea from setting home into the harbour. Kelp grows more or less all over the anchorage in a depth of 5 fathoms.

Hesquiat Bluff, the East entrance point of the harbour, is a remarkable low wooded point with a shingle beach around it; a reef, which covers at a quarter flood, lies half a mile S.W. of it.

The shores of the harbour are generally low and wooded, and within the entrance at a distance of 2 cables clear of danger. At the head on the East side is Boat Basin, a small cove with 4 fathoms. There is a large fresh-water stream there, and vessels may wood and water with great facility. On the West side of the bay near Estevan Point are several indications of coal, and the land is apparently fertile. The natives though friendly are much inclined to pilfering, and should be carefully watched.

Directions.—Hesquiat Harbour is easy of access to sailing vessels even with a foul wind. In entering either from the East or West, give the outer shores of the harbour a berth of more than half a mile, till past the bar, after which they may be approached to 2 cables; anchor in 7 or 8 fathoms near the centre of the harbour, about half a mile from the head. *Leading Mountain*, at the head of the harbour, and 2,726 ft. high, if brought to bear N. by W. $\frac{1}{2}$ W., will lead across the bar clear of dangers, but over a small spot of 3 fathoms.

In strong South or south-westerly gales the sea breaks heavily over the bar, but the anchorage is always safe, and landing is at all times practicable in Boat Basin.

ESTEVAN POINT, 14 miles W. $\frac{1}{2}$ N. from Rafael Point, and 92 miles W. by N. $\frac{1}{2}$ N. from Cape Flattery, is a low wooded and projecting point. A rocky ledge a mile wide extends nearly 1 mile off its S.W. side; and $1\frac{1}{2}$ mile off shore, and nearly 3 miles West of the pitch of the point, is *Sunday Rock*, so that in rounding the West part of Estevan Point, it would not be prudent to approach the shore within 2 miles. *Hole in the Wall*, the South part of the point, may be easily known by a remarkable gap in the trees at its extreme, which is conspicuous from the S.W.

From the western part of Estevan Point the coast takes a N.N.W. direction for 8 miles to Escalante Point at the entrance of Nootka Sound, being low, and foul ground exists off it for some distance.

NOOTKA SOUND.—This celebrated place was, until 1789, supposed to be on the continent of America, but the discovery of its insular character deprived it of the great importance previously attached to it.

It was named by Captain Cook, who came hither in his last and disastrous

* Of this the Introduction some Spaniards
† The active of the her Superior Capt. Nath John Moore

voyage, *King George's Sound*, but he afterwards found that it was called Nootka by the natives, and hence by that name it has ever since been known. It is stated, however, that no word more nearly resembling Nootka than *Yukuatl*, or *Yuguot*, the name applied to Friendly Cove, has since been found.

It communicates with the Pacific by two openings, the southern one of which is probably the Port San Lorenzo, in which the Spanish navigator, Ensign Juan Perez, was, with his ship, the *Santiago*, on August 10th, 1774 (St. Lawrence's day). He had been despatched by the Mexican viceroy to survey and take possession of these lands.*

Cook had heard that a Spanish expedition had been hither, and the foregoing fact was confirmed by the former purchasing from the natives two silver table-spoons apparently of Spanish make, one of which was worn as an ornament, and had probably been stolen from the *Santiago*.

From the accounts contained in Cook's voyage of the furs procured here, several vessels were fitted out from the East Indies to take advantage of the enormous profits they afforded. The earliest of these appears to be that of James Hanna, an Englishman, under Portuguese colours, who reached Nootka in April, 1785. He repeated the voyage in 1786, but then he had to compete with others, Capts. Lowrie and Guise, in two small vessels from Bombay, and Capts. Meares and Tipping from Calcutta, all under the East India Company.†

It was in the prosecution of this trade that Capt. Meares stated that he had purchased a tract for the erection of a house and factory in Nootka Sound, which subsequently led to very serious results. The Spaniards had claimed, by right of a papal bull, dated 1493, the whole of these countries, and also by the subsequent right by discovery; but they had not erected any fort, or in any other way taken possession of it. In consequence of the orders, or the misunderstanding of them, from the Spanish government, the *Iphigenia* was taken possession of by Estevan Martinez, who had accompanied Perez in 1774, and who had been sent hither to assert and maintain this claim. The *Argonaut*, under Capt. Colnett, was subsequently seized, and the captain sent a prisoner to San Blas, he suffering from delirium or insanity in consequence. From this and other matters the respective governments warmly took up the cause, and the consequences were some warlike preparations, which cost England three millions sterling, but which were quieted by the *Nootka Con-*

* Of this voyage no account appeared until 1802, when a short notice of it was given in the Introduction to the *Journal of the Sutil and Mexicana*. A more perfect notice from some Spanish MSS. will be found in Greenbow's *History of Oregon, &c.*, pages 114—116.

† The accounts of these fur trades between 1785 and 1789 will be found in the Narrative of the Voyage of the Ship *Queen Charlotte*, by her Captain, John Dixon, or rather by her Supercargo, Beresford; the Narrative of the Voyage of the Ship *King George*, by Capt. Nathaniel Portlock; and the Narrative, before quoted, of the Voyages of Capt. John Meares.

vention of October, 1790, by which the South Seas were opened to British enterprise. The preparation of these fleets, however, was not without some results. They did good service afterwards, as Lord Howe's victory was gained by them four years later.

Vancouver was subsequently sent to recover possession of these lands, but did not then succeed as he intended, the Spaniards having erected a fort here, and the possession still remained undecided. In 1818, Spain concluded a treaty with America, in which she ceded all her possessions South of lat. 42° N. to the former power, leaving the northern part as it had been. This convention was renewed in 1827, and the whole question was definitively settled by the Oregon treaty of 1846.

The first who more minutely examined this important inlet was our great circumnavigator, Cook. Sir Edward Belcher visited and surveyed a part of it in 1839, and it was completely examined by Capt. G. H. Richards, in H.M.S. *Plumper*, in 1862. The following is from the Vancouver Island Pilot by that officer.

Nootka Sound is a large sheet of water upwards of 6 miles in extent, containing several islands, and from its North side three long narrow arms penetrate the land for distances of 18, 7, and 14 miles respectively. Its entrance is between Maquinna and Escalante Points, W. by N. $\frac{1}{2}$ N. and E. by S. $\frac{1}{2}$ S. from each other and distant 4 miles; at the entrance the shores are low, and have several off-lying dangers, but within they become high, rugged, and precipitous, and are everywhere free from danger.

The soundings at the entrance vary from 40 to 60 fathoms, deepening within the sound to upwards of 100 fathoms in many places; to the southward of the entrance, and extending 6 miles West of Estevan and Escalante Points, is a bank of 22 to 30 fathoms water, deepening gradually to the S.W. In the vicinity of Bajo Reef, and to the westward of it, there is 20 to 27 fathoms; but at a distance of 7 miles South of Nootka Island 40 to 60 fathoms will be found. In fine weather the natives will be met with in canoes, in considerable numbers, on these banks, fishing for halibut, which is very plentiful along this coast.

There are four good anchorages in the sound, two of which, Friendly Cove and Plumper Harbour on the East side of Nootka Island, are small, though easy of access to steamers; the former is 1 and the latter 7 miles within the entrance; the others in the Tlupana Arm, though well sheltered, are more inconvenient, being 13 and 16 miles from the entrance.

From seaward the appearance of the land near the entrance of the sound offers to the navigator many striking features, which in fine weather render it almost impossible to be mistaken. The low land of Estevan and Maquinna Points at the entrance, with the breakers off them, *Nootka Cone*, 1,619 ft. high, at the East point of Nootka Island, and if coming from the South or

S.S.W., Conuma Peak, a remarkable steeple-shaped mountain, nearly 5,000 ft. high, is a most conspicuous feature.

Tides.—It is high water in Nootka Sound, on full and change, at 12^h, and the rise and fall is about 12 ft. The tidal streams are everywhere inconsiderable.

ESCALANTE POINT, the East point of entrance of the sound, is low and rocky; some islets, and rocks generally above high water, extend off it in a westerly direction for upwards of a mile. From Escalante Point to Burdwood Point, at the narrowest part of the entrance on the East side, the coast, which still keeps a N.N.W. direction for 3 miles, is bordered by several off-lying rocks.

MAQUINNA POINT, the West entrance point of the sound, is 11 miles N.W. of the western part of Estevan Point, and 4 miles W. by N. $\frac{1}{4}$ N. from Escalante Point; it is low and wooded, and at its extreme is a remarkable bar-topped conical rock, about 60 or 70 ft. high; some rocks extend 3 cables off it in an easterly direction, also along the coast from it to the eastward nearly as far as the entrance of Friendly Cove, and the shore ought not to be approached nearer than three-quarters of a mile till near the latter place.

Bajo Reef, 6 miles S.W. by W. $\frac{1}{4}$ W. from Maquinna Point, and 2 $\frac{1}{2}$ miles S.S.E. of Bajo Point, is about 2 cables in extent, and only breaks in heavy weather. This reef is the only hidden danger outside the sound, and is dangerous to vessels entering it from the westward. Yuquot Point, the East extreme of Nootka Island, kept open eastward of Maquinna Point, and bearing N.E. $\frac{1}{4}$ E., clears its S.E. side by 1 $\frac{1}{2}$ mile.

FRIENDLY COVE, at the East extreme of Nootka Island, just within the narrowest part of the entrance to the sound, and about 2 $\frac{1}{2}$ miles N.E. of Maquinna Point, is about 2 cables in extent, and sheltered from the sea by a small rocky high-water island on its East side. The entrance to it is from the N.E., and a cable wide, and the anchorage within is in from 5 to 9 fathoms, of small extent, affording room only for one vessel of moderate size to lie moored in the middle, though several small ones would find shelter. The shores on both sides of the cove are rocky, and about 60 ft. high on the North side, but at the head is a small space of clear cultivated flat land, around which in the summer the natives build an extensive village.

If desiring to anchor in this cove, round Observatory Islet, the East entrance point, close to, and if in a large vessel moor with anchors S.S.W. and N.N.E., letting go the first immediately on entering the cove. Sailing vessels, unless with a fair wind, would find some difficulty in entering; and if unable to shoot in, it would be preferable to warp or proceed farther up the sound to Plumper Harbour.

When the Spaniards were in possession of this coast in 1792, Friendly Cove was their principal establishment; and when Capt. Vancouver visited it in that year, no less than eight vessels were in it, most of them small, and secured to

the shore by hawsers. At the present date no vestige whatever of the settlement remains.

No fresh water in any quantity can be procured at Friendly Cove, or nearer than Marvins Bay; but fish and deer may generally be obtained in large quantities from the natives.

The West shore of the sound from Friendly Cove runs in a N.N.W. direction for about 6 miles to the entrance of Kendrick Arm and Tah-sis Canal; it is rocky, and some islets run parallel to it. There are two small creeks, with entrances, too narrow for a vessel to enter. The northernmost of them, called by the Spaniards Boca del Infierno, lies abreast the North part of the above-mentioned islands, and $1\frac{1}{2}$ mile from Friendly Cove.

Marvins Bay, 4 miles N.N.W. from Friendly Cove, on the East side of Nootka Island, is of small extent, and open to the southward; it only affords anchorage to a coaster, but there is a large fresh-water stream at the head and just South of it, convenient for watering.

Kendrick Arm, at the West end of Nootka Sound between Nootka and Narrow Islands, is about 5 miles long in a north-westerly direction, and half a mile wide, connected at the North part by a narrow boat pass to the Tah-sis Canal; on the West side, 1 mile from its South part, is Plumper Harbour, easy of access, and well sheltered. Northward of this harbour the shores of the arm on both sides are rocky, terminating in two narrow creeks at the head, useless for purposes of navigation.

PLUMPER HARBOUR, on the West side of Kendrick Arm, and 6 miles from Friendly Cove, is a small bay indenting the East side of Nootka Island, about 3 cables in extent, and affording good anchorage in 12 fathoms. It is protected on the East side by two small wooded islets from 30 to 40 ft. high; on the West side the shore is rather swampy, and there are several fresh-water streams.

There is a clear passage into the harbour between the two islets, or to the northward of the North one, which may be rounded at a cable, and there is room for a vessel to lie at single anchor inside; it is the best anchorage in the sound, the only drawback being its distance from the entrance.

Tah-sis Canal, the entrance to which is at the N.W. part of Nootka Sound about 6 miles from Friendly Cove, is a long narrow arm of the sea, nearly straight, and 14 miles long in a N.W. by N. direction; the shores are mountainous, rocky, and steep-to, and there is no anchorage within it.

Bligh Island, lying in the centre of the sound, is the largest island within it, being about 4 miles long in a northerly direction, and 2 miles wide in the northern part; its shores are rocky, and indented by some creeks on the southern side. Its South extreme is a long narrow point, about 3 miles N.E. of the entrance of the sound, and off its South and West sides are a number of islands extending upwards of a mile from it, all steep-to on their outer edges,

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but among which no vessel should venture. The South part of the island is rather low, but it rises in the North and West parts to 1,000 and 1,200 ft.

Resolution Cove, at the S.E. point of this island, just within the entrance of the Zuciarie Channel, is only deserving of notice as the spot where Capt. Cook refitted his ships in April, 1778;* it is only a slight bend in the coast, with a deep and rocky bottom, and inconvenient for an anchorage, being also open to the S.W.

Zuciarie Channel, between the East shore of Nootka Sound and Bligh Island, is about 5 miles long in a northerly direction, and upwards of half a mile wide in the narrowest part; its shores are high, and clear of danger, the soundings within the channel varying from 80 to 100 fathoms.

Guaquina, or Muchalat Arm, extends 17 miles in an E.N.E. direction from the N.E. part of Nootka Sound, and varies in breadth from a quarter to upwards of a mile. It is bounded on both sides by mountains from 2,000 to 4,000 ft. high, and presents similar features to the inlets before described along this coast, terminating in low land at the head.

On the North side of this arm, 14 miles within the entrance, is an extensive valley, through which flows a large stream, named *Gold River*, indications of that metal having been there discovered.

Tlupana Arm, the entrance to which is in the North part of Nootka Sound, is about 7 miles long in a northerly direction, branching off at the head in two smaller arms extending to the N.W. and N.E. Its shores are high and rocky, and the soundings in it vary from 80 to upwards of 100 fathoms; there are two anchorages, one at Deserted Creek on the West side, and the other at Head Bay, the termination of the N.W. branch.

Deserted Creek extends 2 miles westward, and the best anchorage is in 12 to 14 fathoms, about one-third of a mile from the stream falling into its head. Vessels may also anchor in *Island Cove*, on the North shore of the entrance of Deserted Creek, in 12 fathoms, on the West side of the islet.

Head Bay is nearly a mile long, and 4 cables wide, with three very low islets on the North side of its entrance. The anchorage is in 14 to 16 fathoms, about one-third of a mile from the head of the bay. There is also anchorage in the bay eastward of Head Bay, formed by the lofty Perpendicular Head and the coast northward of it.

The mountains at the North part of this arm are the highest in the sound, many being from 4,000 to 5,000 ft. above the sea. *Conuma Peak*, rising 7 miles N.E. from the head, is 4,889 ft. high, and of a steeple shape.

DIRECTIONS.—Entering Nootka Sound from the southward, after round-

* In the second volume of the account of his last voyage there are given very ample details of the people, their manners, appearance, disposition, and resources, which are familiar to most. He calculated, of course at a venture, the number of people occupying the villages, the only inhabited parts of the sound, to be about 2,000.

ing Estevan Point, steer about N.N.W. for the entrance, which will be easily made out by the rocks off Escalante and Maquinna Points. Keep about 2 miles off the eastern shore till past Escalante Point, when steer up mid-channel into the sound. If bound to Friendly Cove, haul over to the West side of the entrance for Yu-quot Point, which may be approached to a cable, and rounding it sharply, anchor or moor, as most convenient, in Friendly Cove, in from 5 to 9 fathoms.

If bound to Plumper Harbour, after passing Yu-quot Point, keep about half a mile from the N.E. side of Nootka Island, on a N.N.W. or N. by W. course for a distance of 5 miles to the entrance of Kendrick Arm, when steer up the latter in mid-channel till abreast Plumper Harbour, which may be entered by passing between Bold and Pass Islets on its East side, or going to the northward of the former; anchor in 11 to 12 fathoms near the centre of the harbour.

Should it be desired to anchor in any of the anchorages within Tlupana Arm, if provided with the chart, no directions whatever are necessary.

Entering Nootka Sound from the westward, on nearing Bajo Point, do not approach the South shore of Nootka Island within 4 miles, or shut in Bight Cone with Bajo Point N. by W. until Yu-quot Point comes open East of Maquinna Point N.E. $\frac{1}{4}$ E., which will clear Bajo Reef; a vessel may then steer for the entrance of the sound, about N.E. by E., not approaching the shore between Maquinna and Yu-quot Points nearer than a mile, until abreast the latter, which may be rounded close-to, when proceed up the sound as before directed. If beating into Nootka Sound, when standing to the westward, keep Yu-quot Point open East of Maquinna Point N.E. $\frac{1}{4}$ E., this will keep a vessel well clear to the eastward of Bajo Reef.

Nootka Sound is the easiest place of access on the whole of the West coast of Vancouver Island, the entrance being nearly 2 miles wide in the narrowest part; and, by attending to the above directions, any sailing vessel may beat in or out of the sound.

NOOTKA ISLAND, which bounds the West side of Nootka Sound, is of considerable extent, being 15 miles long in a northerly, and 20 miles in a westerly direction. Its South, or outer shore, is low, rising gradually inland to summits 1,500 to 2,500 ft. above the sea, and has a beautiful and fertile appearance; it is bordered by a sandy beach nearly the whole distance, and the sea breaks heavily along it.

Bajo Point $6\frac{1}{2}$ miles West of Maquinna Point, is low and rocky. A ledge, named the *Inner Bajo Reef*, extends $1\frac{1}{2}$ mile off it in a southerly direction; and Bajo Reef, described in page 429, lies $2\frac{1}{2}$ miles S.S.E. of the point.

Westward of Bajo Point the coast takes a W.N.W. direction for 10 miles to Ferrer Point, and is slightly indented. A remarkable summit, *Bight Cone*, 540 ft. high, rises 3 miles N.W. by N. from Bajo Point, and is about 1 mile inland.

NUCHATLITZ INLET, on the N.W. side of Nootka Island, about 18 miles W. by N. $\frac{1}{2}$ N. from the entrance of Nootka Sound, is 6 miles long in a north-easterly direction, and 3 miles wide at the entrance, narrowing towards the head. Its shores are high and rocky, and much broken into creeks and small bays. Off the entrance and within are several dangers, making it advisable for strangers not to attempt to enter without a pilot. *Ferrer Point*, the South entrance point of the inlet, is low and rocky; just within the point to the eastward is a very remarkable conical summit, 350 ft. high, called the *North-west Cone*, which is of great use in making out this locality from the westward.

Danger Rock, lying in the South part of the entrance, upwards of a mile N.W. $\frac{1}{2}$ W. from Ferrer Point, is the worst danger in entering, as it is of very small extent, and only breaks in heavy weather; it is steep-to on all sides, there being 11 fathoms close to it. The best passage into the inlet is between this rock and Ferrer Point. *Nuchatlitz Reef*, in the centre of the entrance, and a third of a mile North of Danger Rock, is about three-quarters of a mile long E.N.E. and W.S.W., generally breaks, and at its inner extremity is a small rock, awash at high water; there is a clear deep passage between it and Danger Rock, but it ought not to be attempted by a stranger. *South Reef*, which lies just within the entrance on the South side, is 1 mile N.E. by N. from Ferrer Point, and about 3 cables off shore; it is nearly 2 cables in extent, and covers at half flood.

Fitz Island, in the centre of the inlet, and 3 miles from the entrance, is of small extent, low, rugged, and covered with a few stunted pine trees, the tops of which are about 100 ft. above the sea. At half a mile West of it is a small bare rock 20 ft. high, and steep-to on the West side, but between the rock and Fitz Island foul ground exists. *Mary Basin*, the termination of this inlet, is of considerable extent, and completely landlocked by *Lord Island*, which lies across the inlet at the S.W. part of the basin; it has not been sufficiently examined to recommend its being used by a stranger.

Port Langford, on the North side of Nuchatlitz Inlet, 2 miles within the entrance, is about $1\frac{1}{2}$ mile long in a northerly direction, and varies in breadth from a quarter to 1 mile. The soundings in it vary from 5 to 8 fathoms, and it affords a secure and well sheltered anchorage at the distance of half a mile from the head. Within the entrance it is clear of danger. *Colwood Islet*, at the S.W. extreme of the entrance, is small and bare, 20 ft. above water.

Directions.—Entering Nuchatlitz Inlet from the southward, bring Ferrer Point on a N. by W. bearing, and steer to pass half a mile West of it; and when Mark Hill, at the head of the inlet, comes on with the North part of Fitz Island, N.E. $\frac{1}{2}$ E., haul in for the entrance on that mark, which will lead in clear of Danger Rock. When Ferrer Point bears South, a vessel will be inside the rock, and may steer N. by E. $\frac{3}{4}$ E., or N.N.E., for the entrance to Port Langford; pass midway between Colwood Islet and Belmont Point, and

North Pacific.

proceed up the port in mid-channel, anchoring in 5 or 6 fathoms, mud, at a distance of half a mile from the head.

Approaching the port from the westward, keep an offing of 4 or 5 miles, till Ferrer Point bears East, when steer for it on that bearing till the leading mark for the channel comes on, Mark Hill in line with the North part of Fitz Island N.E. $\frac{1}{2}$ E., when proceed as before directed.

No vessel of any size should attempt to beat into this inlet, as there is generally a heavy sea at the entrance, and no stranger should attempt to enter unless the leading mark is well made out.

ESPERANZA INLET, the entrance of which lies between the N.W. side of Nootka Island and the main of Vancouver, at 122 miles W. by N. $\frac{1}{4}$ N. from Cape Flattery lighthouse, is about 16 miles long in a winding north-easterly direction, and its average breadth is about 1 mile, narrowing at the head, which is connected by a narrow pass, Tah-sis Narrows, to the Tah-sis Canal in Nootka Sound.

The entrance, though wide, contains several dangers; but within the shores are nearly everywhere steep-to, rising on both sides to mountains of considerable height. The southern shore is indented by three bays of moderate extent, which, however, afford no anchorage; and from the northern one three arms of considerable length penetrate the Vancouver shore for several miles in a N.N.W. direction. In the western arm, named Port Eliza, is the only anchorage within the inlet.

The soundings in the entrance vary from 12 to 20 fathoms, deepening within to upwards of 100 fathoms in many parts.

Middle Channel, the widest and best into Esperanza Inlet, is 3 miles long in a northerly direction, and upwards of a mile wide in the narrowest part. Its entrance lies 3 miles W.N.W. from Ferrer Point. The West side is clear, except at the South part, where lies Middle Reef, a part of which is always above water.

Blind Reef, which lies at the S.E. extreme of the channel, and 3 miles N.W. $\frac{1}{4}$ W. from Ferrer Point, is about 2 cables in extent, and only breaks in bad weather. A small rock lies a cable northward of it. **Needle Rock**, which is of small extent, lies two-thirds of a mile North of Middle Reef, and has from 14 to 15 fathoms at a distance of 2 cables West of it. **Middle Reef**, at the S.W. entrance point of Middle Channel, and separating it from North Channel, generally breaks, and at its South extreme is a small rock, 4 ft. above high water, lying 4 miles N.W. by W. $\frac{1}{4}$ W. from Ferrer Point.

Low Rock, 6 ft. above high water, is the outermost of the dangers off Catala Island, and lies nearly a mile due West of Middle Reef. To the N.N.E. of it are several other rocks and dangers. **Black Rock**, 20 ft. above high water, one-third of a mile eastward of the East point of Catala Island, should not be approached nearer than 2 cables.

North Channel leads into Esperanza Inlet West of Middle Reef, between

it and the dangers off the S.E. point of Catala Island. It is about a third of a mile wide, and upwards of 2 miles long, merging at the North part into Middle Channel. The soundings in it vary from 17 to 22 fathoms, and the dangers on its West side are nearly all above water.

Catala Island, $5\frac{1}{2}$ miles N.W. $\frac{1}{2}$ W. from Ferrer Point, on the West side of the entrance to Esperanza Inlet, is about $1\frac{1}{2}$ mile long, in a westerly direction, and a mile wide in its broadest part. This island is wooded, and from 150 to 200 ft. high; its shores are rocky, and several dangers exist at a considerable distance off it on all sides. Its North side is separated from the Vancouver shore by a passage half a mile wide, named Rolling Roadstead, and a vessel may find a tolerably secure anchorage there in from 4 to 6 fathoms, though generally a swell prevails in it.

Rolling Roadstead.—*Entrance Reef*, about 3 cables North of the East point of Catala Island, at the eastern part of Rolling Roadstead, is of small extent, and covers at half flood. At half a mile North of it, and about 2 cables off the opposite shore, lies *Arnold Rock*, which is awash at high water. Half a mile inshore, and overlooking the N.E. part of Rolling Roadstead, is *Leading Mountain*, 1,104 ft. above the sea. It is of conical shape, and conspicuous from the entrance of Middle Channel.

Double Island lies half a mile off the West shore at the inner and narrowest part of the entrance to Esperanza Inlet, and $3\frac{1}{2}$ miles within the outer part of the North and Middle Channels. It is of small extent, and wooded. *Flower Islet*, on the opposite shore, 1 mile E.S.E. of Double Island, and half a mile off the N.W. point of Nootka Island, is small and bare, and the northernmost of the islets off Nootka Island between the entrances of Nuchatlitz and Esperanza Inlets. At 2 cables S.W. of it is a small rock 2 ft. above high water.

Hecate Channel, near the head of the inlet, is 5 miles long in a winding direction to the eastward, and its average breadth is about 6 cables. The western end is 8 miles from the entrance of Esperanza Inlet; and the eastern end, named *Tah-sis Narrows*, is about a cable wide, with 28 fathoms, and connects this channel with the Tah-sis Canal in Nootka Sound. The shores are high and rocky, and may be approached close-to.

Port Eliza, the entrance to which is on the North side of the inlet, 1 mile N.E. of Double Island, is a narrow arm $5\frac{1}{2}$ miles long in a N.W. direction, and its breadth varies from 2 to 4 cables. There is good anchorage in from 14 to 15 fathoms at the distance of half a mile from the head, which terminates in a small patch of low swampy land.

Harbour Island, in the centre of the entrance, is of moderate height. The passage into Port Eliza on its East side, through *Birthday Channel*, is 2 cables wide in the narrowest part, and clear of danger. Between Harbour Island and the West shore lies *False Channel*, which has irregular soundings, and in its South part are two rocks which cover at half flood. *Channel Reef*, half a mile

N.N.W. of Harbour Island, in the middle of Port Eliza, is about a cable in extent, and covers at three-quarters flood.

Queen's Cove, on the East side of the port, about $1\frac{1}{2}$ mile from the entrance, is 4 cables long and 2 cables wide, with from 6 to 7 fathoms water, and affords room for a large vessel to lie moored in the centre. Its shores are high and rocky. The cove is completely landlocked, and only half a cable wide at the entrance.

Espinoza Arm, the entrance to which is 2 miles N.E. of Port Eliza, is 8 miles long in a N.N.W. direction, and its average breadth is half a mile. The soundings within it are deep, and it affords no anchorage; at the entrance on the West side are some small islets, and a rock which uncovers.

Zeballos Arm, the entrance to which lies 10 miles within the inlet, at the West end of Hecate Channel, is about 6 miles long in a winding direction to the N.W., and about two-thirds of a mile wide. Similar to *Espinoza Arm*, it offers no anchorage whatever, and is of no use to the navigator.

Directions.—A stranger entering *Esperanza Inlet* from the southward, through *Middle Channel*, and intending to anchor in *Port Eliza*, should pass *Ferrer Point* at a distance of about 3 miles, and keep on a northerly course till nearing the entrance of *Middle Channel*, when steer to bring *Leading Hill* in line with *Black Rock N. by W.*, which will lead through the fairway, and clear of the dangers on both sides of the channel. When the South point of *Catala Island* bears W.N.W., the vessel will be inside the dangers at the entrance, and should keep about N.N.E. for the entrance of *Port Eliza*, passing from 2 to 3 cables East of *Double Island*. In entering the port, steer through *Birthday Channel*, passing a cable East of *Harbour Island*; when past the East point of the latter, keep about N.W. by N. for the entrance of *Queen's Cove*, or farther over to the eastern shore, to avoid *Channel Reef*. In entering the cove, pass to the West of the island at its entrance, and moor immediately the vessel is inside, anchors N.W. and S.E.

If going to the head of the port, keep on as before directed till within a cable of *Queen's Cove*, when haul sharply to the westward, keeping about 1 cable off the East shore till *Fairway Island* comes on with the East point of *Harbour Island S.E. by E.*, when the vessel will be West of *Channel Reef*, and may steer up the port in mid-channel.

No sailing vessel of any size should attempt to enter *Port Eliza* unless with a steady fair wind.

If bound to *Rolling Roadstead*, enter *Middle Channel* as before directed, but instead of steering for the entrance of *Port Eliza*, keep on a N. by W. or N. $\frac{1}{2}$ W. course (passing about a quarter of a mile East of *Black Rock*), until the outer extreme of the islets off the N.W. part of *Catala Island* comes open North of the low grassy point on its North side, bearing W. by S., when haul in for the roadstead on that mark, which will lead midway between *Arnold*

and Entrance Reefs. Anchor in 6 fathoms, with the extremes of Catala Island bearing W.S.W. and S.E. by S.

Entering Esperanza Inlet from the westward, keep an offing of $2\frac{1}{2}$ or 3 miles from Catala Island (if Kyuquot Hill be made out, by keeping it open West of Tat-chu Point N.W. by W., a vessel will be well clear of any dangers off Catala Island), till Double Island comes in line with Black Rock N.E. by E. $\frac{1}{2}$ E., and enter the inlet through North Channel with this mark on, which leads in clear of danger. When the Twins bear W. by N., haul more to the eastward, passing one-quarter of a mile outside Mid and Black Rocks.

Generally a heavy swell prevails off the entrance of the Nuchatlitz and Esperanza Inlets, and no sailing vessel should attempt to enter or leave either of them, unless with a steady fair or leading wind.

The COAST, westward of Catala Island to Tat-chu Point, runs in a westerly direction for upwards of 3 miles, is indented by two small sandy bays, and bordered by a number of rocks, some of which extend nearly 2 miles off shore. *Tat-chu Point* is clifty, with a reef extending nearly half a mile off it, and there is a native village of considerable size at half a mile East of it. *Eliza Dome*, a remarkable summit, 2,819 ft. above the sea, rises $1\frac{1}{2}$ mile within the point, and is very conspicuous from seaward.

From Tat-chu Point the coast turns to N.W. by W. for 7 miles to the entrance of Kyuquot Sound, and is indented by several small bays, in some parts of which boats may find shelter.

BARRIER ISLANDS.—At 2 miles westward of Tat-chu Point is the commencement of a chain of small islands and reefs, bordering the coast of Vancouver Island for nearly 20 miles in a westerly direction to the entrance of Ou-ou-Kinsh Inlet. They extend in some parts as far as 5 miles off shore, and through them are two known navigable channels, the Kyuquot and Halibut, leading to anchorages; the former channel leads into Kyuquot Sound, and the latter into Clan-ninick Harbour, but as a rule no stranger should venture into them, or among these islands. *Highest Island*, one of the Barrier group, lying 2 miles South of Union Island, is a remarkable bare rock 98 ft. high, and useful in identifying Kyuquot Channel. In thick weather it is imprudent to approach the Barrier group within a depth of 40 fathoms.

KYUQUOT SOUND, the eastern entrance of which is 12 miles from Esperanza Inlet, is a large broken sheet of water penetrating from the coast to a distance of 14 or 15 miles inland in two large arms, and several smaller ones. There is a large island at the entrance, named *Union Island*, and on either side of it is a channel into the sound, only the eastern one being fit for large vessels. There are also several islands within, mostly small. Its shores are generally rocky, and very much broken, rising within to high mountains, 2,000 and 4,000 ft. above the sea.

The soundings outside vary from 20 to 40 fathoms, generally sandy bottom. At the entrance there is from 40 to 60 fathoms, but within the sound the

depths increase in many places to upwards of 100 fathoms. There are three anchorages, Narrowgut and Easy Creeks, and Fair Harbour, the two latter being of considerable size, but at a distance of 13 and 10 miles from the entrance; the former is very small, but only 5 miles within the sound.

Kyuquot Channel, leads into the sound through Barrier Islands, and to the eastward of Union Island. It is nearly straight, about 5 miles long in a N.N.E. direction, and its breadth is little less than a mile. The soundings within it vary from 30 to upwards of 40 fathoms, increasing gradually to the inner part, and a mid-channel course through is clear of danger.

East Entrance Reef, one of the Barrier group lying at the S.E. extreme of the channel, $6\frac{1}{2}$ miles W. by N. $\frac{1}{4}$ N. from Tat-chu Point, is about 2 cables in extent and 4 ft. above high water. No vessel should stand inside it.

Rugged Point, the S.E. entrance point of Kyuquot Sound, is upwards of 2 miles North of East Entrance Reef on the East side of the channel. It is rugged and rocky, but steep-to on the West side. Between it and East Entrance Reef are a number of rocks, among which no vessel should venture.

West Rocks, at the S.W. extreme of Kyuquot Channel, and 2 miles N.W. $\frac{1}{4}$ W. from East Entrance Reef, are two in number, and 50 ft. above high water. Some rocks, which cover at a quarter flood, extend half a mile S.E. of them, with 20 fathoms close to their outer edge.

White Cliff Head, the S.E. extreme of Union Island, is 1 mile N.N.E. of West Rocks, and abreast Rugged Point; it is about 70 ft. high, faced to the southward by a remarkable cliff, with 35 fathoms within 1 cable of it. Half a mile within the head is *Kyuquot Hill*, a remarkable summit 740 ft. high, bare of trees on its East side, and very conspicuous from seaward.

Chat-Channel Point, the N.W. extreme of Kyuquot Channel, and the East point of Union Island, is a low rocky point, with a remarkable nob just inside it. A rock, which uncovers at a quarter flood, lies 2 cables East of it.

Leading Island, just northward of Kyuquot Channel, and nearly $3\frac{1}{2}$ miles from White Cliff Head, is about $1\frac{1}{4}$ mile long in an East and West direction, and half a mile wide. Its shores are steep-to, and the island rises near the centre to a summit 400 ft. high, which kept midway between White Cliff Head and Rugged Point, N. by E. $\frac{3}{4}$ E., leads into the sound through the fairway of Kyuquot Channel.

UNION ISLAND, in the entrance of the sound, and protecting it from the ocean, is of square shape, and upwards of 3 miles in extent. Its surface is undulating, rising in the N.W. part to nearly 1,500 feet.

Blind Entrance leads into the sound westward of Union Island, between it and the Vancouver shore, forming a narrow tortuous channel with some rocks in the outer part, and which should not be entered by a stranger; coasters, however, often enter the sound by this channel, but no directions can be given for navigating it.

Narrowgut Creek, in the S.E. part of the sound, about $1\frac{1}{2}$ mile from the

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termination of Kyuquot Channel, is very narrow, and 1 mile long in a north-easterly direction. The soundings in it vary from 16 to 8 fathoms, and there is only just room for a vessel to moor, as its breadth is less than a cable. The creek is easy of access to a steamer. *Shingle Point*, at the entrance of the creek on the North side, was the observation spot used in the sound, and is in lat. $49^{\circ} 59' 55.5''$ N., long. $127^{\circ} 9' 30''$ W.

Deep Inlet, at $1\frac{1}{2}$ mile N.W. of Narrowgut Creek, is about 3 miles long in a north-easterly direction, but affords no anchorage. On its North side, at the entrance, is a remarkable high precipice.

Ho-hoae Island, nearly in the centre of the sound, and half a mile North of Union Island, is about 2 miles long in a north-easterly direction. On its N.E. side is *Dixie Cove*, where a small craft may anchor in 6 fathoms completely landlocked. *Pinnacle Channel*, between Ho-hoae Island and the East shore of the sound, is about 3 miles long in a northerly direction, and half a mile wide, clear of danger.

Tah-sish Arm, in the North part of the sound, has its entrance 5 miles from the termination of Kyuquot Channel. It is 6 miles long in a winding direction to the northward, and its shores, except at the head, are high, rugged, and generally steep-to. The head terminates in low swampy land. There is one anchorage 1 mile within the entrance, on the East side, called Fair Harbour.

Fair Harbour is of oblong shape, $2\frac{1}{2}$ miles in length in a N.E. direction, from 3 to 4 cables wide, and affords anchorage near either end in from 13 to 11 fathoms; its shores generally are high and steep. From the East end a bank dries off a cable, and the western one is a low narrow neck about a cable wide at low water, and separates the harbour from Pinnacle Channel. The entrance to it, which lies on the North side near the middle, is nearly a mile long, and from 1 to 2 cables wide, with some small islets on its North side, the soundings in it being very irregular, varying from 5 to 20 fathoms. In entering keep the South shore close on board. This harbour can be entered by steamers or sailing vessels with a fair wind.

Moke-tas Island, in the North part of the sound, between the entrance to the Tah-sish and Kok-shittle Arms, is about 2 miles long, and 1 mile wide, rocky, and about 400 ft. high; its East and West sides are steep-to. At 1 cable off its North shore, near the centre, is a rock under water, and to the S.E. of it lie *Channel Rocks*, a small patch about 3 ft. above high water; they are, however, steep-to.

Kok-shittle Arm, the entrance of which is in the N.W. part of the sound, about 6 miles from Kyuquot Channel, is upwards of 8 miles long in a north-westerly direction, and about a mile wide at the entrance, narrowing gradually towards the head; its shores are rocky, and of a broken outline, with several small islets off them. The soundings vary from 20 to 80 fathoms, shoaling gradually towards the head. There are no dangers, and a very good anchorage,

the best in the sound, lies on its West side, at a distance of 4 miles from the entrance. The head of the arm terminates in low swampy land, through which flows a small stream, and a bank extends off about 2 cables. Just to the N.E. of this Garibaldi Peaks rise to a height of 4,458 ft. *Easy Creek*, on the West side of Kok-shittle Arm, and 13 miles from the entrance of the sound, is about 2 miles long in an E.S.E. direction, turning sharply round from its entrance to the southward, and running parallel to the inlet, being separated from it by a narrow rocky peninsula. There is good anchorage from half a mile within the entrance to the head. It ought to be entered in mid-channel.

Chamis Bay, formed in the West side of Kyuquot Sound, about 1 mile from the North part of Blind Entrance, is nearly half a mile in extent, but affords no anchorage, the water being too deep.

Directions.—No sailing vessel should attempt to enter Kyuquot Sound, unless with a steady fair, or leading wind, as generally a heavy swell prevails outside, which in a light wind would render her position critical; and no stranger should attempt to venture in, unless provided with the chart, the weather clear, and the leading mark for the channel well made out.

Entering the sound by Kyuquot Channel, which is the only one a stranger ought to use, keep a good offing, till the entrance of the channel is made out (White Cliff Head and Kyuquot Hill at the S.E. point of Union Island, which have been before described, are very conspicuous, and will identify the channel), when bring the summit of Leading Island midway between Chat-channel and Rugged Points N. by E. $\frac{1}{2}$ E., and steer up the channel with that mark on. In nearing Chat-channel Point, give it a berth of at least 4 cables to avoid the rock which lies off it.

CLAN-NINICK HARBOUR, on the Vancouver shore, 3 miles to the westward of Kyuquot Sound, is about 1 mile long in a westerly direction, half a mile wide, and affords good anchorage in from 7 to 10 fathoms, at the distance of half a mile from the head, from which a sand-bank extends 2 cables.

The harbour is protected by some islands of the Barrier group from the ocean, and there is only one channel, the Halibut, into it through them, which though clear of danger, ought not, except under unavoidable circumstances, to be attempted by a stranger.

HALIBUT CHANNEL, which runs through the Barrier group from the ocean to the entrance of Clan-ninick Harbour, lies westward of Table and Village Islands, and East of Look-out Island. It is about 3 miles long in a northerly direction, and half a mile wide in the narrowest part. The soundings in it vary from 16 to 6 fathoms, being somewhat irregular; but a mid-channel course through, except in the northern part, is clear of danger.

Table Island, on the East side of the channel, is the largest of the Barrier group, being nearly half a mile in extent, and about 150 ft. high. *Trap Bluff*, on the West side of the island, is conspicuous.

Half a mile East of Table Island is an anchorage with from 4 to 6 fathoms, tolerably sheltered by some islands from seaward, and much used by coasters in summer months. The entrance to it is rather intricate, and no stranger, or any except a small vessel, should attempt to enter.

Village Island, on the East side of Halibut Channel, just North of Table Island, is small, and about 150 ft. high; on its East side is a large native village, much frequented in summer; off it a bank dries nearly 3 cables. To the eastward of this island is a small cove among the Barrier Islands, called *Barter Cove*, with from 1 to 3 fathoms; it is well sheltered in all weather, and much frequented by coasters when fur trading. The entrance to it is very narrow, and almost choked up with rocks.

Two cables North of Village Island is a rock awash at high water springs, but there is from 5 to 6 fathoms at a distance of a cable off the West side.

Look-out Island, at the South entrance point of Halibut Channel, lies nearly 1 mile S.W. of Table Island; it is small, covered with a few trees, and about 150 ft. high. *Granite Island*, which forms the South side of Clan-ninick Harbour, is about half a mile in extent, and joined by a sandy beach at low water to the Vancouver shore; 3 cables East of its East point is a very dangerous rock *Chief Rock*, which lies at the termination of the Halibut Channel, and only uncovers at low water springs.

As before noticed, no stranger should attempt to enter this harbour without a pilot, unless from absolute necessity, and if in a sailing vessel, only with a steady fair wind.

Notice was given, in 1880, that a sunken rock, on which the Hudson Bay Company's steam-vessel *Princess Louise*, drawing 9 ft., recently struck at low water spring tides, is reported to lie nearly midway in the entrance of this harbour, at the distance of 2 cables North of Chief Rock.

OU-OU-KINSH INLET, 10 miles W.N.W. from Kyuquot Sound, is 7 miles long in a north-easterly direction, and $1\frac{1}{2}$ mile wide at the entrance, narrowing gradually towards the head; the shores within are high, rising from 2,000 to upwards of 3,000 ft. This inlet, and Nasparti Inlet, are faced by many rocks and detached reefs, making access to them very difficult to a stranger.

The soundings in the inlet vary from 40 to 60 fathoms, and there is only one indifferent anchorage, Battle Bay, just within the entrance, on the West side. The entrance lies West of the Barrier Islands, is a mile wide in the narrowest part, and the soundings in it vary from 14 to 48 fathoms.

Clara Islet, at the S.E. extreme of the entrance, is small, bare, and 20 ft. above high water; no vessel ought to go eastward of, or approach it within half a mile. This islet is the westernmost of the Barrier Islands, and lies $21\frac{1}{2}$ miles W. by N. from Tat-chu Point, where they may be almost said to commence.

Bunsby Islands, on the East side of entrance, close inshore, are about 2 miles in extent, and from 200 to 300 ft. high. The passages between them and the shore are choked up with rocks, but their West side is steep-to. Pinnacle Point and Green Head at their S.W. extreme are remarkable. To the northward of these islands is *Malksops Inlet*, 4 miles long in a north-easterly direction, but the entrance is intricate, and there is no anchorage within it.

Cuttle Group, lying at the S.W. entrance point of Ou-ou-Kinsh Inlet, and $1\frac{1}{2}$ mile N.W. of Clara Islet, is composed of a number of small islets and rocks, some of the former being wooded. Nearly 1 mile S.W. of them is a rock which breaks in fine weather. On the Vancouver shore, just N.W. of them, is a remarkable summit, the *Lone Cone*, 356 ft. high, useful in identifying the entrance.

Sulivan Reefs are a very dangerous patch of rocks lying nearly 3 miles outside the entrance of Ou-ou-Kinsh Inlet, $2\frac{1}{2}$ miles W. by S. from Clara Islet, and nearly 4 miles S.S.E. of Hat Island in Naspardi Inlet. They are about half a mile in extent East and West, and only break occasionally; there is from 10 to 11 fathoms close around them. The entrance to Ou-ou-Kinsh Inlet open N.N.E., leads $1\frac{1}{2}$ mile eastward of the reefs; Solander Island, just open of the land East of Cape Cook, and bearing West, leads $1\frac{1}{2}$ mile southward of them; Hat Island in line with a summit on the West side of Naspardi Inlet, bearing North, leads $1\frac{1}{2}$ mile westward of them; and Hat Island seen between the Haystacks, N.W. by N., leads three-quarters of a mile N.E. of them.

Battle Bay, which is just within the entrance of Ou-ou-Kinsh Inlet on the West side, is upwards of a mile wide, and half a mile deep, with several islets and rocks inside it near the middle. Near the North part there is anchorage in from 6 to 9 fathoms, which may be used in fine weather.

NASPARDI INLET, $3\frac{1}{2}$ miles West of Ou-ou-Kinsh Inlet, on the East side of a large peninsula of which Cape Cook is the S.W. extreme, and in the head of an open bight or bay, is about 4 miles long in a northerly direction, and about half a mile wide at the entrance, decreasing in some places to less than 3 cables. Its shores are high and rocky, indented by some slight bays. There is a fresh-water stream at the head, from which a bank extends about 3 cables. The soundings vary from 13 to 30 fathoms, and there is a secure though rather limited anchorage, in from 13 to 16 fathoms, at the distance of half a mile from the head. Outside the entrance are several dangers, but none within, and the projecting points may be approached to a cable's distance.

Sulivan Reefs, just described, lie $3\frac{1}{2}$ miles S.S.E. of the entrance, and appear to be pretty steep-to on the West side.

Haystacks, off the East side of the entrance, and $1\frac{1}{2}$ mile North of Sulivan Reefs, are two bare sharp-topped cliffy rocks 65 ft. high, and about 3 cables apart. There is a clear deep passage between them and Sulivan Reefs. *East Rock*, 3 cables off the East entrance point, is of small extent, has 17 fathoms at a cable's distance to the westward of it, and covers at half flood. *Yule Islet*,

about 40 ft. high, lies midway between the Haystacks and East Rock. *Mile Rock Breaker* lies $1\frac{1}{2}$ mile off the West shore of the entrance to the inlet, and 2 miles W. by N. $\frac{1}{2}$ N. from Sullivan Reefs. It is very dangerous to vessels entering the inlet, as it is of small extent, and only breaks in heavy weather. No vessel should stand to the westward of this danger.

Mile Rock, nearly a mile North of the above-mentioned danger, is a small bare rock, 12 ft. above high water. *Hat Island*, lying in the centre of the inlet just within the entrance, is small, and has a few stunted trees on the summit; from the southward it is very conspicuous, and appears somewhat like a hat. It is steep to on the East side, but nearly midway between it and the West shore is a shoal patch of $2\frac{1}{2}$ fathoms, marked by kelp. In entering the inlet pass eastward of the island.

Nasparti Inlet should not be used by a stranger unless unavoidably necessary, as in thick or cloudy weather it might be difficult to make out the leading marks, and no one should attempt to enter unless they are well made out, especially as the outlying dangers only break in heavy weather, and are seldom seen. A sailing vessel ought, in passing the entrance of this and Ou-ou-Kinsh Inlet, to keep Solander Island open South of the land East of Cape Cook bearing West.

BROOKS PENINSULA, to the westward of Nasparti Inlet, is a peninsula of an oblong shape, 9 miles long, and about 5 miles wide, projecting into the ocean in a S.S.W. direction. Its shores are generally very rocky, and rise almost abruptly from the sea to upwards of 2,000 ft. There are several off-lying dangers around it, some of which extend upwards of a mile off shore.

CAPE COOK, or **Woody Point**, the S.W. extreme of this peninsula, and the most projecting point of the outer coast of Vancouver Island, is 163 miles W. by N. $\frac{1}{2}$ N. from Cape Flattery lighthouse, and 69 miles W. by N. $\frac{1}{2}$ N. from Estevan Point. The cape rises abruptly from the sea to a summit 1,200 ft. high. Nearly 1 mile westward of it lies *Solander Island*, which is bare, 580 ft. high, and has two sharp summits. Between it and the cape the passage is choked up with rocks, and no vessel or even boat should go inside the island.

At a distance of 2 miles off Cape Cook and the South side of the peninsula, the soundings are from 20 to 90 fathoms, and, as a rule, no vessel should approach nearer.

BROOKS BAY, on the West side of the peninsula, is a large open bay, about 12 miles wide and 6 miles deep. There are several dangers within it, and two inlets, Klaskish and Klaskino, which afford anchorage, but are very difficult of access, and no vessel should attempt to enter either unless embayed and unable to get out of Brooks Bay. With strong westerly winds a tremendous sea is sent into it.

Clerke Reefs lie in the S.E. part of the bay, and 5 miles North of Cape Cook; their outer part is 3 miles off the East shore of the bay. They cover

an extent of upwards of 2 miles; some are under water, others uncover, and no vessel should venture among them. *Single* and *Double Islets* lie near the shore at their western end.

Klaskish Inlet, at the head of Brooks Bay, on the West side of the peninsula, and 10 miles N.N.E. of Cape Cook, is about 2 miles long in a north-easterly direction, and 1 mile wide at the entrance. At its head is a long narrow basin, the entrance of which is too contracted for a vessel to enter. There is an anchorage just within the entrance of the inlet on the South side, to the eastward of Shelter Island, but it is difficult of access to a sailing vessel.

Surge Islets, on the South side of the entrance, about a mile off shore, are small, rocky, and about 40 ft. high; foul ground exists among them. *Shelter Island*, just within the entrance of the inlet on its South side, is about half a mile in extent, 300 ft. high, with a summit at each end covered with a few stunted trees. The anchorage on its East side is about a third of a mile in extent, with from 10 to 13 fathoms, well sheltered, but the bottom is irregular. The entrance to it, round the N.E. side of the island, is less than a cable wide in the narrowest part.

Between Shelter Island and the North entrance point of the inlet is a heavy confused sea, which would be dangerous for sailing vessels, as the wind generally fails there.

Entering the anchorage on the East side of Shelter Island, do not bring Cape Cook to the southward of S.E. by S. $\frac{1}{2}$ S., till Leading Cone, a remarkable summit at the head of the inlet, about 500 high, comes in line with Small Islet on the North side of the entrance, bearing N.E. by E. $\frac{1}{2}$ E., which mark will lead into the inlet well North of Clerke Reefs and Surge Islets. When abreast the latter, haul a little to the eastward, so as to enter midway between Small Islet and Shelter Island; pass within a cable East of the bare islet off the latter's N.E. point, and anchor in 13 fathoms, with the extremes of Shelter Island bearing N.W. by W. $\frac{1}{2}$ W. and S.W. $\frac{1}{2}$ W.

The entrance of this anchorage is intricate and narrow; and unless unavoidably necessary, no vessel larger than a coaster should attempt it, as a furious sea rages all around the outer parts.

Ship Rock, lying nearly 8 miles N. by W. of Cape Cook, 2 miles off the shore in the centre of Brooks Bay, and midway between Klaskish and Klaskino Inlets, is of small extent, and has from 17 to 20 fathoms close on its South and East sides. The sea generally breaks very heavily over it. Small Islet in line with Leading Cone, N.E. by E. $\frac{1}{2}$ E., leads three-quarters of a mile southward of it.

KLASKINO INLET, the entrance to which is in the North part of Brooks Bay, and 10 miles N. $\frac{1}{2}$ W. from Cape Cook, is nearly 6 miles long in a winding direction to the E.N.E. There are numerous rocks off the entrance, but a safe though intricate passage through them; and there is also a good anchorage on

the South side, 2 miles within the inlet. The soundings vary from 12 to 40 fathoms, increasing gradually inside, which becomes narrow, with high and rocky shores, terminating in low land at the head.

Nob Point, the South entrance point of the inlet, is rocky, and covered with a few stunted trees; some rocks extend 3 or 4 cables off it, and close to its outer part is a rocky nob about 100 ft. high. *Anchorage Island*, in the middle of the inlet, about 2 miles within the entrance, is of small extent, and rocky. The anchorage or harbour is between the East side of this island and the shore; it is well sheltered. Inside Anchorage Island some rocks extend nearly across the inlet, rendering it almost impossible for a vessel to go beyond them.

Red Stripe Mountain, rising on the North side of the entrance, abreast Anchorage Island, is a remarkable conical-shaped summit, 2,200 ft. high, with a valley on either side of it. On its South part, facing seaward, is a conspicuous red cliffy stripe or landslip, easily distinguished from the outside; the lower part of it in line with Twenty-foot Rock, bearing N.E. by N. $\frac{1}{4}$ N., leads into the entrance South of Channel Reefs, and nearly 2 miles N.W. of Ship Rock.

Twenty-foot Rock, 4 cables W.N.W. of Nob Point, is bare, and 20 ft. above high water. It is conspicuous from the outside. The only channel into the inlet is to the westward of the rock, between it and Channel Reefs.

Channel Reefs, the S.E. part of which is $3\frac{1}{2}$ cables W. by S. of Twenty-foot Rock, are an irregular cluster of rocks, mostly under water, extending in a westerly direction to the N.W. shore of Brooks Bay. There is deep water between them in many places, but the only safe passage into Klaskino Inlet is upwards of 3 cables wide, with deep water between their S.E. part and Twenty-foot Rock.

If obliged to enter Klaskino Inlet, when outside Ship Rock, bring Twenty-foot Rock in line with the lower part of the red stripe on Red Stripe Mountain, bearing N.E. by N. $\frac{1}{4}$ N., and run boldly for the entrance with that mark on, which will lead $2\frac{1}{2}$ cables South of Channel Reefs; keep on this course till within 2 cables of Twenty-foot Rock, when haul a little to the northward, and pass it on its North side at a cable's distance, after which steer about N.E. by E. $\frac{1}{4}$ E. for the centre or South part of Anchorage Island, passing a cable or so North of the rocks off the South side of the inlet. When abreast the S.W. point of the island, haul quickly to the eastward, round the rocks off its S.E. point within half a cable, and anchor in from 9 to 10 fathoms, midway between the East side of the island and the main, with the extremes of the former bearing N.W. and S.W. by W. A large vessel should moor.

The entrance to Klaskino anchorage is even more intricate than that of Klaskish, and should not be attempted by a stranger unless absolutely necessary for safety. Fresh water may be procured in both these anchorages.

At 3 miles from Klaskino, in the N.W. part of Brooks Bay, is a large rivulet where boats may enter and find shelter in bad weather.

LAWN POINT, the N.W. extreme of Brooks Bay, lies 12 miles N.W. by N. from Cape Cook; it is low, and some rocks extend more than half a mile in an easterly direction from it, inside of which a boat may find shelter. The sea breaks violently about this point, and everywhere along the shores of Brooks Bay. The land in the vicinity of Lawn Point appears very fertile, and lightly timbered; it rises gradually from the sea to a height of 1,900 ft.

QUATSINO SOUND, the north-westernmost of the deep inlets on the outer coast of Vancouver Island, is an extensive arm of the sea, which penetrates the island in a north-easterly direction for upwards of 25 miles. The breadth at the entrance is nearly 6 miles, narrowing to less than a mile at a distance of 5 miles within; the sound then runs in a north-easterly direction, nearly straight for 13 miles, when it branches off in two arms, one extending to the S.E. for 12 miles, and terminating in low land. The other arm lies to the northward of, and is connected with, the sound by a straight narrow pass about 2 miles long; its length is 22 miles in an East and West direction, and the eastern extreme, Rupert Arm, is only 6 miles distant from Hardy Bay, on the N.E. side of Vancouver Island. The western part terminates within 12 miles of San Josef Bay on the outer coast. Just within the entrance of the sound, on the North side, is Forward Inlet, a much smaller arm, about 6 miles long in a northerly direction, in which are the best anchorages of the sound.

The shores of Quatsino Sound are generally high, and near the entrance very much broken, with many good sheltered anchorages. There are several islands within and along its shores, but they are mostly small.

From the outside the entrance of Quatsino Sound presents several remarkable features, which render it easy to be made out. Along the South side of the entrance are several rocks and small islands; on both sides of, and within the sound the land is high, and some of the summits are very conspicuous, among others the Flat-top and Entrance Mountains to the northward of the entrance, and the Nose Peak and Gap Mountains inside, Nose Peak being easily distinguished from its sharp rocky summit.

The soundings in the entrance, and from 3 to 5 miles outside, vary from 30 to 70 fathoms, but within they deepen in many places to upwards of 100 fathoms. There are several dangers along the South shore at the entrance. In the fairway are two very dangerous rocks, which only break in heavy weather, and it requires great caution on the part of the navigator to avoid them, when entering or leaving the sound.

It is high water in Quatsino Sound, on full and change, at 11^h, the rise and fall of tide being about 11 feet.

Reef Point, the S.E. entrance point of the sound, is 14 miles N.W. by N. from Cape Cook, and 1½ mile from Lawn Point, the N.W. extreme of Brooks Bay. It is low and rocky, but rises gradually to a well-defined summit, 1,901 ft. above the sea. The coast between it and Lawn Point forms a slight bay, filled with a number of rocks extending to a considerable distance off

shore. *Boat River*, which runs into a small bight on the South shore of the sound, $5\frac{1}{2}$ miles within Reef Point, is merely a small stream which a boat can enter.

Bold Bluff, 7 miles North of Reef Point, on the South side of the sound, is, as its name implies, a bold, rocky salient bluff, rising suddenly to upwards of 200 ft., when it slopes gradually to a summit, upwards of 1,600 ft. high; it may be safely approached to a cable. At this spot the sound contracts in breadth to less than a mile.

Surf Islands, upwards of a mile S.S.W. of Bold Bluff, and 3 miles within the entrance of the sound, are a chain of small islands, about 1 mile long in a N.W. and S.E. direction, some of which are covered with a few stunted trees, and are about 40 ft. above high water; a short distance from them are a number of breaking rocks, but at 3 cables from their South and West sides there is from 10 to 30 fathoms.

Entrance Island, $5\frac{1}{2}$ miles N.W. $\frac{1}{4}$ N. from Reef Point, at the N.W. entrance point of the sound, is small and rocky, about 140 ft. high, and covered with a few stunted trees. It is steep-to on its S.E. side.

Danger Rocks, a mile within the entrance, nearly in the fairway, are two very dangerous pinnacle rocks, of small extent, and steep-to on all sides; as they very seldom break, great caution is required, on entering or leaving the sound, to avoid them. The *North Danger* lies 7 cables E.N.E. from Entrance Island, and breaks at low water. The *South Danger* is half a mile S.E. of the North rock, and is awash at low water spring tides; there is deep water between them. Between Danger Rocks and Surf Islands, the passage is $1\frac{1}{2}$ mile wide, and clear of danger.

Pinnacle Islet in one with the East point of Low Islands, N.W. by N. $\frac{1}{4}$ N., leads midway between North Danger Rock and Entrance Island; Robson Islet open North of Entrance Mount Point, N.W. by W. $\frac{1}{4}$ W., leads 3 to 4 cables East of the rocks; Village Islet just touching Brown Point, N.W., leads midway between them and Surf Islands; Bedwell Islets, within the sound on the North side, open North of Bold Bluff, bearing N.E., leads one-quarter of a mile northward of North Danger Rock; and Bold Bluff in line with the gap in the centre of Surf Islands, bearing N. by E. $\frac{3}{4}$ E., leads nearly a mile S.E. of the South Danger.

FORWARD INLET, on the North side of the sound 1 mile within the entrance, is about 6 miles long, first taking a north-westerly direction for 2 miles from its outer part, then turning to the N.N.E. for 4 miles, and contracting in breadth; it becomes shoal at the head, and terminates in large salt-water lagoons. There are two anchorages within it, North and Winter Harbours, the former easy of access to sailing vessels; both are very secure, and well sheltered.

Entrance and Flat-top Mountains, on the West side of the inlet near the entrance, are very conspicuous objects from seaward; the former is 1,275 and

the latter nearly 1,000 ft. high. *Pinnacle Islet*, three-quarters of a mile northward of Entrance Island, at the S.W. entrance point to Forward Inlet, is a small jagged rock about 40 ft. high, with a few trees on its summit.

Low Islets are three small wooded islets on the S.W. side of Forward Inlet, nearly a mile within the entrance. *Robson Island*, in the bend of Forward Inlet on the West side, $1\frac{1}{2}$ mile from Pinnacle Islet, and half a mile northward of Low Islets, is about half a mile in extent, and 385 ft. high; its shores are rocky, but at a distance of a cable free of danger on the North and East sides. A small village stands on the East side of Forward Inlet, abreast Robson Island, and close off it is *Village Islet*, a small bare islet about 40 ft. high, which is rather conspicuous.

Bare Islet, lying $1\frac{1}{2}$ cable off the shore, at a short distance eastward of the N.E. entrance point to the inlet, is about 12 ft. high, and steep-to on the outside. *Burnt Hill*, 1,095 ft. high, just over the N.E. entrance point of Forward Inlet, is remarkable from the southward, being bare of trees and cliffs on its South side; at 1 mile N.E. of it is another conspicuous summit, named *Nose Peak*, 1,730 ft. high, with a bare rocky top.

North Harbour, which lies to the N.W. of Robson Island, in a bight on the West side of Forward Inlet, is a snug and secure anchorage, about 4 cables in extent, with from 4 to 6 fathoms. The entrance is 3 cables wide, rendering the harbour easy of access to sailing vessels; it is perhaps the best anchorage within the sound, and from being only 4 miles within the entrance is very convenient. *Browning Creek*, in its western part, is $1\frac{1}{4}$ mile long, but very narrow, with from 2 to 5 fathoms water, and terminates in a shallow basin, dry at low water.

Observatory Islet, which lies on the North side of the entrance to the harbour, is a small bare rock, connected at low water to the main; in lat. $50^{\circ} 29' 25''$ N., long. $128^{\circ} 3' 39''$ W.

Winter Harbour comprises that part of Forward Inlet which runs in a N.N.E. direction, and is a capacious anchorage with from 8 to 11 fathoms. Its shores are low, and bordered by a sandy beach, and the harbour becomes shoal at a distance of a mile from the head; its breadth varies from 2 to 6 cables.

Log Point, just outside the entrance of this harbour on the East side, is low, and bordered by a sandy beach; to the southward of it, and extending 4 cables off shore, is *New Bank*, with $3\frac{1}{2}$ fathoms on the shoalest part, and contracting the breadth of the entrance passage to the harbour to less than a cable; but by keeping a little over to the West side when abreast North Harbour, a vessel of the largest size may avoid this bank, and enter Winter Harbour without danger.

Pilley Shoal, of 3 fathoms, on the North side of the sound, is of small extent, steep-to on the outside, and marked by kelp. It lies $1\frac{1}{2}$ cable off shore, and 1 mile West from Bold Bluff.

Bedwell Islets, lying $5\frac{1}{2}$ miles within the entrance, off a projecting point on the North side of the sound, are of small extent, wooded, and separated from the shore by a very narrow boat pass, which is conspicuous from the entrance; at 3 cables N.E. of them is *Monday Shoal*, with 4 fathoms, which is marked by kelp, and steep-to on the outside.

Koprino Harbour, 8 miles within the entrance, in the centre of a bay on the North side of the sound, is a perfectly landlocked but small anchorage, affording room for one or two ships to lie moored within. It lies to the northward of *Plumper Island*, which is about half a mile in extent, low, wooded, and steep-to on all sides, there being a good passage on either side of it into the harbour.

Dockyard Island, in the West part of the harbour, midway between Plumper Island and the North shore, is small, but may be approached close to; there is good anchorage 1 cable South of it, in 14 fathoms. *Wedge Island* lies at the eastern limit of the anchorage, about 1 cable North of Plumper Island; there is a deep passage close to on either side of it into the harbour. *Observation Islet*, at the N.E. extreme of the harbour, is bare, and about 12 ft. high; lat. $50^{\circ} 30' N.$, long. $127^{\circ} 52' 16'' W.$

East Passage leads into Koprino Harbour, eastward of Plumper Island. It is half a mile wide at the entrance, and is clear of danger. *Prideaux Point*, the East entrance point of East Passage, is low, and bordered by a sandy beach.

The North shore of Quatsino Sound from Prideaux Point takes a general north-easterly direction for 9 miles to Coffin Islet, at the entrance of Hecate Cove. From Bold Bluff the South shore of the sound runs nearly parallel to the northern one for 13 miles in a north-easterly direction. It is high, and indented by two bays of considerable size, and some small creeks, none of which afford anchorage.

Limestone Island, 15 miles within the entrance, and in the centre of the sound, is the largest island in the sound, nearly 3 miles long, and about three-quarters of a mile wide in the broadest part. Its shores are rocky, but clear of danger, and the island is of moderate height.

South-East Arm, the entrance of which is a mile East of Limestone Island, and 18 miles within the entrance of the sound, is 10 miles long in a south-easterly direction, and varies in breadth from 3 cables to 1 mile. Its shores are generally high and rugged, but terminate in low land at the head.

Whitestone Point, at the separation of the two arms at the head of Quatsino Sound, is a rocky point of moderate height, and lies three-quarters of a mile N.E. of Limestone Island, abreast Coffin Islet. *Bull Rock*, which covers, and is marked by kelp, lies 3 cables South of it, and 2 cables off shore.

Hecate Cove, on the North shore, about 1 mile N.E. of Coffin Islet, runs in about two-thirds of a mile in a north-westerly direction, is from 2 to 3 cables

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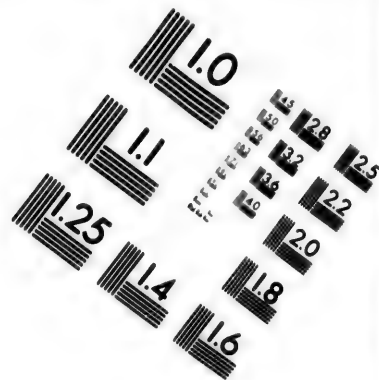
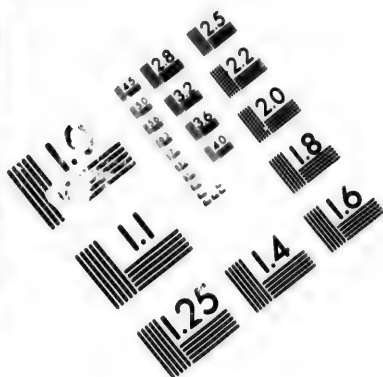
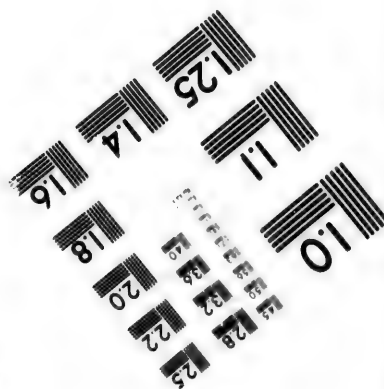
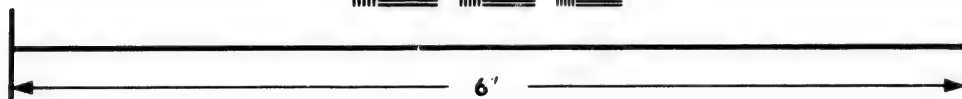
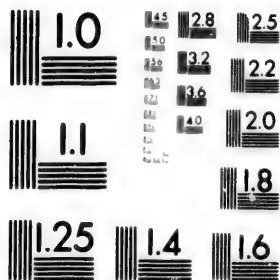


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wide, and affords good anchorage near the centre in 9 to 11 fathoms. The entrance is clear of danger, but in the inner part of the cove, near the North side, are some shoal patches, marked by kelp, with only 11 ft. water in some parts. This cove is convenient for steamers or small craft. *Round Island*, nearly in mid-channel about a mile East of Hecate Cove, and just South of Quatsino Narrows, is small, and of moderate height; there is a clear passage between it and the North shore, but the one South of it is filled with rocks.

Quatsino Narrows, 20 miles inside the sound and connecting it with the Rupert and West Arms, are 2 miles long in a northerly direction; the shores are high and rocky, but at half a cable's distance clear of danger. The tide runs through these narrows at a rate of from 4 to 6 knots, and the streams turn shortly after high and low water.

Rupert Arm, to the N.E. of Quatsino Narrows, is 5 miles long in a north-easterly direction, and nearly a mile wide; its shores are high and clear of danger. Its head terminates in low land, and a bank dries off it for 2 cables.

West Arm trends in a westerly direction nearly 18 miles from the North part of Quatsino Narrows, and varies in breadth from 2 cables to a mile. Its shores are generally high and rocky; the northern one is indented by several small bays. There are two anchorages, one at Coal Harbour, on the North side, and the other at the edge of the bank extending from the head. *Coal Harbour*, 2 miles from the narrows, on the North side of West Arm, is of square shape, from 3 to 4 cables in extent, and affords good anchorage near the middle in from 12 to 14 fathoms. Indications of coal have been met in its vicinity.

Directions.—Entering Quatsino Sound from the southward, give Reef Point, its S.E. entrance point, an offing of about 2 miles, and steer North till Bold Bluff comes in line with the gap in the centre of Surf Islands, N. by E. $\frac{3}{4}$ E., which mark kept on will lead S.E. of Danger Rocks; when the West side of Robson Island comes open North of Entrance Mount Point in Forward Inlet N.W. by W. $\frac{1}{2}$ W., or Village Islet, on the East side of that inlet, is just touching Brown Point, bearing N.W., a vessel will be well East of these rocks. If bound up the sound, round the North end of Surf Islands at a distance of about half a mile, or if going to Forward Inlet, steer about N.W. by W., taking care not to shut in the South side of Robson Island with Entrance Mount Point, until Bedwell Islets come open North of Bold Bluff, bearing N.E., when she will be well North of Danger Rocks. Pass from 1 to 2 cables off the East sides of Low Islets and Robson Island, and rounding the North point of the latter, at the same distance, enter North Harbour, and anchor in from 4 to 6 fathoms near its centre.

If intending to anchor in Winter Harbour, when abreast the North part of Robson Island, steer N.N.W., keeping well over to the West shore to avoid New Bank, and when past it enter the harbour in mid-channel, anchoring in 11 fathoms about half a mile North of Grass Point. If bound to Koprino

Harbour, which can only be entered by steamers or sailing vessels with a fair wind, round the N.W. point of Surf Islands at about half a mile, and steer up the sound in mid-channel until abreast the harbour. If in a large vessel, go through the East passage, keeping from 1 to 2 cables off Plumper Island; enter the anchorage close-to on either side of Wedge Island, and moor immediately the vessel is West of it, anchors North and South; a vessel may also enter by West passage, and anchor in 14 fathoms South of Dockyard Island.

In navigating the sound to the eastward of Koprino Harbour the chart is the best guide, and a mid-channel course is everywhere free of danger; sailing vessels of any size should not, however, go eastward of that harbour, as the anchorages beyond are rather difficult of access for them. If wishing to anchor in Hecate Cove, enter it in mid-channel, passing North of Limestone Island, and moor immediately the vessel is inside the entrance points; the tide runs from 1 to 3 knots abreast the entrance, and should be guarded against.

Going through the Quatsino Narrows, keep well over to the North shore, pass North of Round Island, round Turn Point close-to, and guarding against tide, steer up the narrows in mid-channel; these narrows ought only to be attempted at slack water or with a favourable tide, unless in a full-powered steamer. The best anchorage North of the narrows is Coal Harbour, and if wishing to go there, a N.W. course for 2 miles from the narrows will lead to its entrance, and a vessel may anchor near the centre in from 12 to 14 fathoms. In navigating the West Arm keep well over to the South shore, when in the vicinity of Pot Rock and Stragglings Islands.

Entering Quatsino Sound from the westward, keep an offing of about 2 miles, till Entrance Island bears N.E. or N.E. by N., when steer to pass about 2 cables East of it, but not further off. When abreast it haul to the northward, bringing Pinnacle Islet in line with the East side of Low Islets, bearing N.W. by N. $\frac{1}{4}$ N., and steer up with that mark on till Bedwell Islets come well open North of Bold Bluff, bearing N.E., when enter Forward Inlet, or proceed further up the sound, as before directed.

If the weather be so thick that the marks for clearing Danger Rocks cannot well be made out, a vessel, if able to distinguish Entrance Island, may enter the sound by steering for it on a N. by E. or north-easterly bearing; pass close to its East side, and haul to the northward when abreast it; by keeping half a mile on that course, she will be well clear N.W. of Danger Rocks, and may proceed anywhere up the sound. On a clear night in fine weather, a vessel may also enter in the above manner.

There is room, with a steady breeze, for a smart working vessel to beat into the sound to the southward and eastward of Danger Rocks, though without previous knowledge of the place it would be rather hazardous to attempt it. If obliged to do so, when standing to the northward towards Danger Rocks, tack when Bold Bluff comes in line with the centre of the northernmost

(wooded) Surf Island, bearing N.E. by N. $\frac{1}{2}$ N.; and in standing to the South shore, tack when Bold Bluff comes in line with the S.E. extreme of Surf Islands bearing N. $\frac{1}{2}$ E. or N. by E. When the South side of Robson Island comes open North of Entrance Mount Point, N.W. by W. $\frac{1}{2}$ W., she will be eastward of Danger Rocks, and may stand further to the northward.

Beating between Surf Islands and Danger Rocks, tack at about 3 cables off the former; and in standing towards the latter, keep Robson Island open as before directed, till Bedwell Islets come open North of Bold Bluff, N.E.

The Coast of Vancouver Island from Quatsino Sound to Cape Scott, the N.W. extreme of the island, runs in a general W.N.W. direction about 26 miles; it is generally rocky and iron-bound, indented by several bays, mostly small, and from the projecting points some rocks extend in parts nearly a mile off shore. At a distance of 2 miles off there is from 20 to 30 fathoms, sand and rock, deepening to 100 fathoms at 10 to 11 miles off shore; to the southward of Scott Islands the 100-fathoms line does not appear to extend more than 6 miles from them.

In navigating between Cape Scott and Quatsino Sound, do not approach the shore nearer than 2 miles.

Ragged Point, 3 miles from the North entrance point of Quatsino Sound, is a rocky, rugged point of moderate height. *Open Bay*, which lies just inside it, affords landing for boats in fine weather on its East side. The coast between Open Bay and the entrance to Quatsino Sound is high and cliffy; some rocks extend nearly a mile off it.

Top-knot Point, 5 miles N.W. of Ragged Point, is low, with a summit 300 ft. high, shaped like a top-knot, just within it; some rocks extend half a mile to the southward from it. *Raft Cove*, 8 miles from Ragged Point, is an open bight about a mile in extent, and affords no shelter whatever. *Cape Palmerston*, 11 miles N.W. from Ragged Point, is a bold, rocky point, rising to a summit 1,412 ft. high; some rocks extend half a mile from it.

SAN JOSEF BAY, the entrance to which is 14 miles N.W. from Ragged Point, and 8 miles S.E. of Cape Scott, is an extensive open bay, 3 miles deep in a north-easterly direction; the breadth at the entrance is nearly 2 miles, narrowing gradually towards the head. Its shores are high, and off the South side are several off-lying rocks; the soundings vary from 11 to 4 fathoms, but the bay affords no shelter whatever, except with northerly winds, and should only be used as a stopping-place in fine weather. The best anchorage is near the centre, in 7 to 9 fathoms.

Sea Otter Cove, just West of San Josef Bay, is about a mile long in a northerly direction, and from 2 to 3 cables wide. There is 5 fathoms in the entrance, and from 1 to 3 fathoms inside it, also several rocks; the shelter within is very indifferent, and the place only fit for a conster. A cluster of bare islets lies off the entrance.

CAPE RUSSELL, 16 miles from Ragged Point, and immediately westward of Sea Otter Cove, is a remarkable headland 870 ft. high, and the outer part of a peninsula formed by Sea Otter Cove and a small bay N.W. of it. Some rocks, which break very heavily, extend nearly a mile South of the cape.

From Cape Russell to Cape Scott the coast, from 500 to 600 ft. high, trends in a north-westerly direction, and is indented by three open bays, which are nearly a mile deep, but afford no shelter whatever.

CAPE SCOTT, the N.W. point or extreme of Vancouver Island, is about 500 ft. high, and connected to the island by a low sandy neck about 1 cable wide. Some rocks extend West of it for more than half a mile, and there is a bay on either side of the neck, which would afford anchorage to boats or small craft in fine weather only. Close to its S.W. extreme is a small creek among the rocks, difficult of access, but once within it, boats may get shelter in southerly gales. The water being deep close up to the rocks, Cape Scott should always have a wide berth given to it.

Scott Islands, and the northern and eastern coasts of Vancouver Island, will be described in the next Chapter.

CHAPTER VII.

BRITISH COLUMBIA, ETC.

At the commencement of the preceding Chapter a brief account is given of the history of the hydrography of Vancouver Island, and incidentally of that of the main land adjacent. It will not be necessary to add much to that. Vancouver's survey was an admirable reconnaissance of the shores of the strait, which he made known to the world almost for the first time. But its more important channels and features are now completely represented in the fine series of charts executed from the surveys made by Capt. G. H. Richards, assisted by Commander R. C. Mayne, &c., in 1859-65.

In this Chapter will be included an account of the North-east Coast of Vancouver Island, which, lying on the channel which separates it from the continent, could not be well described except in connection with that coast. We follow, therefore, the order in which it is given in the Vancouver Island Pilot.

The country, as is well known, has only been comparatively recently thrown open to the world. Prior to 1858, when the British Government resumed possession of it from the Hudson's Bay Company, only a few posts of fur traders existed throughout the land; but in 1857 gold was first discovered (although long before known to exist by the Hudson's Bay Company's officers), by some Canadian emigrants, who successfully "prospected" the banks of the Thompson and Bonaparte Rivers, tributary to the Fraser, and between March and June, 1858, a rush of gold seekers crowded into the country from California, and to this day this continues to be the chief object of its commerce. In 1866 it was estimated that there were 6,000 white inhabitants on the mainland, including 3,000 miners, who produced £600,000 value in gold dust. The native population, most difficult to estimate, was considered to amount to 40,000. By the census of 1881 the inhabitants of British Columbia (including Vancouver and Queen Charlotte's Islands) numbered 49,459, the area of the country being estimated at 465,978 square miles. The total value of the gold produced in British Columbia between 1858 and 1882 amounted to

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about £9,337,000. The gold fields are far inland, the principal being that called the Cariboo.*

There exist within the limits of British Columbia large deposits of the precious and useful metals, many of which have been systematically and profitably mined for years, while others are only awaiting the development, of which they are capable, to become a source of great wealth to the Province. The list is a long one, embracing gold, silver, copper, iron, lead, cinnabar, platinum, coal, limestone, marble, and salt.—*The West Shore*, September, 1884.

A large portion of the country, especially that near the coast, is unfitted for colonization, owing to its mountainous character.

The *Cascade Range*, through which the Fraser and Harrison Rivers find an outlet to the ocean, is about 60 miles inland, and the Fraser bursts through a gorge in it at about 15 miles above Yale in a succession of terrific rapids or cañons. This part of the river, and of the wonderful road which has been constructed along its banks, is graphically described in the admirable book by Lord Milton and Dr. Cheadle.†

To the northward of Vancouver Island the coast is the western seaboard of the districts formerly known under the names of *New Hanover* and *New Cornwall*. The whole of it is fronted by an immense collection of islands of all dimensions and forms. Within these is a correspondingly extensive series of channels and arms of the sea, forming a most complete chain of inland navigation, which may be pursued for many degrees to the northward, without interruption or exposure to the oceanic swell. It is true that in many parts these canals are too narrow to be very advantageous for sailing vessels to work through, and are therefore more adapted for steam navigation than by other modes; yet the great depth of water, in most parts all but unfathomable, and the boldness of the shores, make this disadvantage of less importance. One feature adverted to by Vancouver, who has excellently surveyed part of this inland navigation, and which is remarkable, is, that caution ought to be used

* The excellent Grand Trunk waggon road from Yale (the head of the navigation on the Fraser River) to the centre of the mining district of Cariboo, a total length of 375 miles, was completed in 1866, through a country full of engineering difficulties, at an expense of over £100,000, and is a result of which the young colony might be justly proud.

† In the higher parts of the Fraser, and indeed of all other rivers which flow into it, a remarkable feature, which extends 300 miles, is described in the same work. Along the sides of the mountains which confine the river beds are three terraces—or benches as they are called—perfectly level, and of exactly the same height on each side of the river, evidently the beaches of some lake in former ages of the world's history. The formation of the canons of the lower Fraser suggested their origin to the travellers. They supposed that the gorge through which the river now flows had been partially broken down, perhaps by some grand convulsion of nature, at three separate intervals, and thus lowered the surface of the lake, the surf of which had worn the beach it washed to a level strand, to the lower levels as they now appear. See "*The North-west Passage by Land*," by Viscount Milton, and Dr. W. B. Cheadle, 1866, pp. 338—347.

in passing close to some of the projecting points, for he found that, notwithstanding the perpendicularity of the cliffs composing the shores, that a shelf would sometimes project under water, from the general line of the upper portion, a fact which, if neglected, might lead to serious consequences.

Besides these channels the continent is penetrated with numerous and peculiar canals, whose characteristics, greatly similar in all cases, will be best gathered from the ensuing descriptions. There are no rivers, or at least none of importance have been discovered. They are mere torrents, fed in summer by the melting of the snow, and in the winter by the untiring deluges of this dismal climate. The Nass, the Babine, Skeena, or Skina, and Stikine, are the only ones that may ascended to any distance, and even these only with considerable difficulty and danger. It has been calculated that the shores of British Columbia (including Vancouver and Queen Charlotte Islands) have an extent of over 7,000 miles.

The primary discovery of the country has been before adverted to, and many of the remarks are as applicable to this as to other portions; but it arose from the zeal and perseverance of two intelligent men, who traded hither under the license of the South Sea Company. These were Capts. Portlock and Dixon; they made the principal discoveries on the coast subsequent to Capt. Cook's visit in his last voyage. Their narratives are, nevertheless, too diffuse, and abound with too much personal narrative and minutiae to afford much general information on the country they visited. It was to the excellent surveys of Vancouver, in 1792, that we owed the greater part of our first knowledge of the inland navigation and nautical information of this country, now supplemented by the survey by Capt. G. H. Richards, R.N., and the officers under him, in 1859—1865, as before mentioned.

Besides Portlock, Dixon, and Vancouver, the Spaniards surveyed a portion, and their charts fill up the vacancies left by the others; but of their surveys we have no verbal description to be of service. In the voyages of Meares, previously adverted to, there are also some notices of visitors to this coast during the origin of the fur trade, as before explained, as arising out of the notice afforded by Capt. Cook. Then Capt. Ingraham visited the S.E. side of Queen Charlotte Island; and Capt. Gray, who discovered the Columbia River, first explored it in the *Washington*, which name he applied to it.

The Climate of the mainland coast opposite Vancouver Island differs somewhat from that of the S.E. portion of Vancouver Island. In summer the temperature averages slightly higher, and in winter somewhat lower, while the rainfall is greater immediately along the coast. The lower Fraser Valley (New Westminster District) does not receive in summer the cold breezes from the Olympian Mountains which blow across Victoria, nor does it receive in winter so much of the genial warmth of the warm ocean air. As a general thing ice forms on the river for a short time, and snow begins to fall in January, and continues to do so intermittently till March, the ground not being

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continuously covered with it. Observations for seven consecutive years—1874 to 1880—at New Westminster, give the highest maximum temperature 92° in July, and the lowest 7° in January, the mean annual rainfall being 59.66 inches.—*The West Shore*, September, 1884, p. 291.

STRAIT OF GEORGIA.—Having passed out of the Strait of Juan de Fuca by either of the channels described in Chapter VI., pages 351—388, *ante*, when to north-westward of a line drawn between the East point of Saturna Island and Whitehorn Point of the main, a vessel may be considered well in the Strait of Georgia, but before entering upon any description of the latter, it may be well to offer a few remarks on the comparative merits of the two main channels which lead into it, viz., Haro and Rosario Straits; both have their advantages and disadvantages under varying conditions.

Haro Strait is more tortuous; the water is so deep that it would be impossible for a vessel to anchor in the main stream, and for its whole length the tides, though not stronger, are more varying in their direction.

Rosario Strait leads by a very gentle curve almost a straight course into the Strait of Georgia; the depth of water, although considerable, is such that if necessary a vessel might anchor in it. In one part it is somewhat narrower than the narrowest parts of Haro Strait, and the tides run with equal strength; it has its sunken rocks and dangers in an equal degree with the Haro, and perhaps the anchorages in point of numbers and facilities for reaching them are equal in both. Extreme care and vigilance are called for in navigating either with a sailing vessel; to one with steam power, neither offer any difficulties.

A glance at the chart will show that to a vessel bound from sea, or from any of the southern ports of Vancouver Island, to the Strait of Georgia, the Haro Channel is preferable, and it will be equally evident that to reach the same destination from Admiralty Inlet or Puget Sound Rosario Strait is the most direct and desirable. Having entered, however, by either channel, the promontory of Roberts Point will be immediately seen with its conspicuous white-faced cliff, and appearing as an island. From the northern entrance of Haro Strait it will bear N.N.W. 11 miles; and from the Rosario N.W. by W. 15 miles.

The general direction of the Strait of Georgia is W.N.W., and from a position midway between Saturna and Patos Islands, 19 miles on this course should take a vessel abreast the entrance of Fraser River, the Sand Heads bearing N.N.E., distant 3 miles; and for this distance the breadth of the strait, not including the deep indentation of Semiahmoo Bay, is 10 miles. Continuing the same course for a further distance of 19 miles, will lead between Burrard Inlet on the East, and Nanaimo Harbour on the West; at this position the entrance of the former bears about N.E. $\frac{1}{2}$ E. 16 miles, and the latter S.W. $\frac{1}{2}$ W. 7 miles.

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The breadth of the strait, after passing the Sand Heads of the Fraser, increases to 14 miles; and between Nanaimo and Burrard Inlet it is 20 miles. The depth of water is from 70 to 100 fathoms between Roberts Point and the western side of the strait, and further to the westward between Burrard Inlet and Nanaimo as much as 200 fathoms in the centre.

The dangers to be avoided in working through the strait are, on the eastern shore, Roberts and Sturgeon Banks; and on the western, the neighbourhood of East Point, and Tumbo Island, and the coasts of Saturna and Mayne Islands, until beyond the entrance of Active Pass. A chain of reefs and rocky islets lie parallel with this shore, in places extending nearly a mile off; and as the bottom is rocky and irregular, with a considerable strength of tide, vessels are recommended not to approach it within 2 miles.

It should also be remembered that the ebb sets to the S.W., through Active Pass, and that tide races occur in its northern entrance. Roberts Bank is easily avoided, especially since the establishment of the pile lighthouse. If the weather is thick, when 50 fathoms is struck, a vessel will be getting very near the edge.

The Tides, although not nearly so strong as among the Haro Archipelago, yet run with considerable strength, as much as 3 knots, particularly during the freshets of summer, when the Fraser River discharges an immense volume of fresh water, which takes a southerly direction over the banks, and almost straight for the mouth of Active Pass. This peculiar milky-coloured water is frequently carried quite across the strait, and is sometimes seen in the inner channels washing the shores of Vancouver Island; at other times it reaches the centre of the channel only, forming a remarkable and most striking contrast with the deep blue waters of the Strait of Georgia.

Below the mouth of the Fraser, the tide is rather the stronger on the western shore. On the eastern side, within the line between Roberts and Sandy Points, scarcely any tide is felt; and vessels will gain by working up on that shore with the ebb, where good anchorage can also be found, if necessary.

Allowance must be made for the tides, which is not difficult, having once entered the Strait of Georgia by daylight, and knowing which tide was running.

The COAST of Washington Territory, to the southward of the boundary separating it from British Columbia, has been previously described in pages 345—348. We now commence with the promontory to the southward of the entrance of Fraser River.

ROBERTS POINT is the termination of a remarkable promontory which stretches southerly from the delta of Fraser River. It presents a broad face to the southward, and its southern extreme is a little more than $1\frac{1}{2}$ mile South of the 49th parallel of latitude, the boundary between British Columbia and the United States: the eastern point of the promontory is a remarkable white-

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faced cliff, 200 ft. high, its summit crowned with trees. From it the land gradually falls to the westward and terminates in Roberts Spit, a low shingle point, within which is a small space of level clear land, where a few wooden buildings were erected on the first discovery of gold in the Fraser River, and named *Roberts Town*; for a few months it served as a depôt for the miners, but it has long been deserted.

From this spit the coast trends to the N.N.W., with bluff shores of moderate height for $3\frac{1}{2}$ miles, when it merges into the swampy delta of the Fraser. From most points of view, and particularly from the southward, Roberts Point presents the appearance of an island. Shoal water and rocky irregular bottom, on which kelp grows in summer, extends for more than a mile E.S.E. from the white face of the point, and vessels are recommended to give it a good berth.

Anchorage will be found on either side of the promontory; to the eastward in 9 fathoms, sandy bottom, with the extreme of the white cliff bearing W.S.W. distant $1\frac{1}{2}$ mile; Roberts Spit, the western termination of the promontory, should be just shut in by the white cliff. To the westward of the spit there is fair anchorage in 8 fathoms good holding ground, with the spit extreme distant three-quarters of a mile, and in one with Mount Constitution on Orcas Island bearing S.E. $\frac{1}{4}$ E., a white flagstaff at the North end of the low land of the point N.E. by E. $\frac{1}{4}$ E., and the bare bluff of the 49° parallel or the monument on its summit N.W.; here the edge of the bank will be distant a quarter of a mile, and a ship should not anchor any further to the northward, as Roberts Bank trends rapidly to the westward.

There is a granite monument, 25 ft. high, erected on the summit of the parallel bluff, which is only just visible from the anchorage on account of the trees; it marks the boundary between the British and United States possessions, and is mentioned on page 348 previously.

Ships should not lie at this anchorage with strong southerly or westerly winds, but should shift round to the eastern one, or to Semiahmoo Bay, which is always safe, and has anchorage in almost any part.

ROBERTS BANK, caused by the sediment deposited by the stream of the Fraser River, extends from the spit of Roberts Point in a W. by N. direction for $9\frac{1}{2}$ miles, to the Sand Heads or river entrance, and at this point is 5 miles from the shore; it then takes a N.N.W. direction for a further distance of 12 miles, joining Grey Point on the North, as it does Roberts Point on the South. The portion of the bank northward of the Fraser has been named *Sturgeon Bank*; it is steep-to, and a mile outside the edge the soundings are from 70 to 60 fathoms, shoaling thence to 20, and immediately after to 2 fathoms. By night the edge of this bank will be cleared by not bringing the light on Atkinson Point, Burrard Inlet, to bear westward of North.

FRASER RIVER, in point of magnitude and present commercial importance, is second only to the Columbia on the N.W. coast of America. In

its great freedom from risk of life and shipwreck, it possesses infinite advantages over any other river on the coast, and the cause of this immunity from the dangers and inconveniences to which all great rivers emptying themselves on an exposed coast are subject, is sufficiently obvious. A sheltered strait, scarcely 15 miles across, receives its waters; and the neighbouring Island of Vancouver serves as a natural breakwater, preventing the possibility of any sea arising which would prove dangerous to vessels even of the smallest class, unless they ground.

To the same cause may be attributed in a great measure the fixed and almost unvarying character of the shoals through which this magnificent stream pursues its undeviating course into the Strait of Georgia; and there can be little doubt that it is destined, at no distant period, to fulfil to the utmost, as it is already partially fulfilling, the purposes for which nature ordained it—the outlet for the products of a great country, whose riches in mineral and agricultural wealth are daily being more fully discovered and developed.

The river, with its numerous tributaries, has its rise in the Rocky Mountains, between 400 and 500 miles from the coast in a northerly direction, from whence it forces its way in torrents and rapids, through one of the many great parallel valleys which intersect this region, confined by gigantic mountains, with large tracts of country, rich in agricultural resources on either side of them, until it reaches the town of *Hope*,* which is about 80 miles by the windings of the river, in an easterly direction from its entrance. A deposit of silver ore has lately been discovered near Hope.

Above the City of *Lytton*, which stands at the fork or confluence of the Fraser and Thompson Rivers, 55 miles above Hope, many rich deltas occur, or as they are termed by the miners, bars, and among these, known as the wet diggings, gold was first discovered in British Columbia.

At Hope the river assumes the character of a navigable stream; steamers of light draught reach this point and even the town of *Yale*, 15 miles above it, during from six to nine months of the year. The Hudson's Bay Company have a station at Yale. In June, July, and August, the melting of the snow causes so rapid a downward stream that vessels, even of high steam power, are rarely able to stem it, and during these months numbers of large trees are brought down from the flooded banks, which offer another serious obstruction to navigation. Between Hope and *Langley*, the latter 30 miles from the river's mouth, there is always a considerable strength of current from 4 to 7 knots, at times more; but at *Langley* the river becomes a broad, deep, and placid stream, and except during the three summer months, the influence of the flood stream is generally felt, and vessels of any draught may conveniently anchor. The depth is 10 fathoms; the current not above 3 knots.

* Hope is an old station of the Hudson's Bay Company. Its site is the most beautiful in British Columbia—a wooded level shut in by an amphitheatre of lofty mountains—Yale upon a grander scale.—Viscount Milton and Dr. Cheadle, p. 348.

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Midway between Langley and Hope the Harrison River falls into the Fraser and by it, a long chain of lakes extending in a general N.W. direction, a comparatively easy route has been established, by which the Upper Fraser is reached at a point just below Bridge River, in the heart of the gold region, thus avoiding that difficult and at present almost impassable part of the country between the town of Yale and the Fountains, by the main river a distance of about 90 miles.

Vessels of moderate draught may enter the Fraser near high water, and proceed as high as Langley (or Derby) with ease, during the summer season, provided they have or are assisted by steam power. The only difficulty is between the Sand Heads and Garry Point, the entrance proper of the river, but while there are competent pilots, and the buoys remain in their positions, this difficulty disappears. The lighthouse is a sufficient guide for making the entrance. It must be remembered, however, that the tides of the Strait of Georgia sweep across the channels of the entrance, and a large ship is recommended to enter or leave with the last quarter of the flood.

The great quantity of deposit brought down by the freshets of summer, has created an extensive series of banks, which extend 5 miles outside the entrance proper of the river. The main stream has forced two almost straight though somewhat narrow channels through these banks, and at its junction with the current of the Strait of Georgia, which runs at right angles to it, has caused the wall-edged bank before alluded to, extending to Roberts Point on the South and Grey Point on the North.

The river is at its lowest stage during the months of January, February, and March. In April it commences to rise from the melting of the snows, and is perhaps 2 ft. above its lowest level; the flood stream is strong enough to swing a ship at New Westminster up to the end of this month. In May the water rises rapidly, the river is at its highest about the end of June, and remains up with trifling fluctuations until the end of July or middle of August. During these six weeks the banks are overflowed, and the extensive plains above Langley covered for a space of several miles; the strength of the stream between Langley and Hope being from 4 to 7 knots, and in the narrow parts even more. The usual rise of the river at Langley due to these floods is about 14 ft., but from the testimony of an officer of the Hudson's Bay Company, who resided more than thirty years there, it has been known to reach 25 feet.

From the middle to the end of August the waters begin to subside, and in September the stream is not inconveniently strong. September, October, and November are favourable months for the river navigation, as the water is then sufficiently high to reach Hope, and the strength of the current considerably abated. The shallow stern-wheel steamers have got to Hope as late as December; between this month and April, owing to the shoalness of the water, and the great quantity of ice formed, navigation even by these vessels, only drawing 18 inches, is attended with great difficulty, and is rarely practicable

at all. The snags or drift trees which become imbedded in the river, also form a serious obstacle to navigation at this season.

In April, the steamers commence again to run. In June, July, and August, the rapidity of the current is the great obstacle, but these high-pressure vessels, commanding a speed of 11 and 12 knots, frequently accomplish the voyage, though at much risk.

The Harrison River route (page 461) obviates some, but not all, of these difficulties. At New Westminster the freshets raise the level of the river about 6 ft., but the banks being high no inconvenience is felt, and the strength of the stream is rarely 5 knots, during the winter 2 to 3 knots; for some miles within the entrance the low banks are partially flooded for a month or six weeks. The rise and fall due to tidal causes is from 8 to 10 ft. at springs, between the Sand Heads and the entrance of the river proper at Garry Point; at New Westminster it is 6 ft., and at Langley scarcely perceptible.

LIGHTHOUSE.—On the S.W. end of Sturgeon Bank, and between the two channels into the river, is a pile lighthouse, 49 ft. high, from which is shown a *fixed bright* light, elevated 52 ft. above high water, and visible 12 miles. A *Bell* is sounded in foggy weather. Lat. $45^{\circ} 9' N.$, long. $123^{\circ} 16' W.$

This light, first exhibited in May, 1884, supersedes that formerly shown from a lightvessel, which was moored off the entrance.

There are no natural marks sufficiently well defined, or which are not too distant, or too liable to be obscured in cloudy weather, to enable a vessel by their help alone to hit the narrow entrances between the Sand Heads with accuracy, or without the aid afforded by the pile lighthouse on the South Sand Head. A large spar buoy is placed on the South Sand Head, at 8 cables S. $\frac{1}{2}$ W. from the lighthouse, and the northern edge of the channel within is marked by smaller buoys.

When up with the lighthouse at the entrance, a remarkable solitary bushy tree will be seen on Garry Point, the northern entrance point of the river proper, straight for which is the general direction of the southern or old channel. It bears from between the Sand Heads N.N.E. a little easterly, and is just 5 miles distant. Although to steer direct for this tree would not clear the outer edges of either bank for the whole length of the channel, yet it will be found an excellent guide, to give almost the straight line in, should the buoys be removed.

The South Sand Head dries before low water, and has frequently a ripple on it when covered. The lighthouse bearing about N. by W. $\frac{1}{2}$ W. leads to the entrance, and when up to the buoys, those on the port or North side of the channel should be kept from half a cable to a cable on the port hand. The least depth in the channel was 11 or 12 ft. at low water, and this occurred about midway between the Sand Heads and Garry Point; but in August, 1884, notice was given that there was only 5 ft. water in this channel, at low water, summer spring tides.

In August, 1884, the Canadian Government gave notice that a new channel had formed through the Sand Heads, with a depth of 8 ft. at low water, summer spring tides, and that it has been marked with *black* spar buoys, numbered consecutively from 1 to 9. The Sand Heads lighthouse bears S.E. $\frac{1}{2}$ S. from No. 1 buoy, distant 19 cables. A *red* buoy is moored on the South Sand Head.

Vessels making for the new channel should, to clear the Sand Heads, keep on the line of Leading Peak, on Anvil Island in Howe Sound, just open westward of Passage Island, bearing N. by W. $\frac{1}{2}$ W., until Garry Bush (Leading Tree) bears N.E. by E., when it should be steered for; leave the black buoys a quarter of a cable on the port hand, and after passing No. 9 buoy, steer for No. 15 fairway buoy, which may be left on either hand, and thence to Garry Point, which should be passed close.

There is always a great quantity of drift wood on the point, and the northern side of the river should be kept aboard for nearly 2 miles, where from 8 to 10 fathoms will be found; it is then necessary to cross to the South side, and to keep close along it, passing the mouth of the South or Boat Channel, nearly 2 miles above which, and abreast a clump of high trees, cross again to the North bank to the left of two low sandy islands; the channel then leads rather along the North side of the river, and with the assistance of the chart will be found sufficiently easy for vessels of 20 ft. draught until 6 or 7 miles above Langley,

It is not, however, recommended for a stranger to enter without a pilot.

NEW WESTMINSTER, at first chosen as the capital of British Columbia, a dignity now ceded to Victoria, stands on the North or right bank of the Fraser River, just above the junction of the North Fork, and 15 miles in a general north-easterly direction from the entrance proper. It occupies a commanding and well chosen position, being within an easy distance of the entrance, and having great facilities for wharfage along its water frontage, a good depth of water, and excellent anchorage.

The river bank is somewhat precipitous in places, and the country at the back is densely wooded, like all the lower parts of the Fraser, unless, indeed, in the immediate neighbourhood of the entrance, where it is swampy grass land, subject to inundation during the freshets of summer; a considerable clearing, however, of the timber has taken place in the vicinity of the town, which has a prominent and thriving aspect, and when the facilities for entering the river and its capabilities are better known, will no doubt rise more rapidly into importance. Several roads connect it with Burrard Inlet.

At present the principal industry at New Westminster is the canning of salmon, with which the river abounds. Sturgeon and the oulachan or candle-fish are also abundant. There are also some saw-mills here. There is communication with Victoria by steamer twice a week, and the telegraph cable,

crossing the Strait of Georgia to Nanaimo, is connected with the line across the continent to Montreal, &c.

The western end of the Canadian Pacific Railway extends along the northern and western banks of the river from near New Westminster to beyond Lytton, where it crosses the river by a fine bridge. As before stated, the railway is expected to be completed early in 1886.

The military establishment or camp of the Royal Engineers, a mile above New Westminster, is a most picturesque spot, commanding an uninterrupted view of the Queen's Reach, a broad, deep, and magnificent sheet of water. From the camp to Port Moody, an excellent harbour at the head of Burrard Inlet, the distance is 4 miles in a North direction; a good road exists between the two places, and a waggon-road to Coal Harbour at the entrance of the inlet. At 5 miles eastward of New Westminster is the entrance to *Pitt River*, which runs in a general direction from N.N.E. to N.E. for 28 miles, terminating in two remarkable lakes enclosed between almost perpendicular mountains, and navigable to the head for vessels of 14 ft. draught, the depth in places being far too great for anchorage. A large tract of low grass land lies on both sides of the entrance of the Pitt, which, however, is generally overflowed, or partially so, during six weeks of summer.

Derby or New Langley is 12 miles above New Westminster in an easterly direction, on the South or opposite side of the river; the channel between is deep, and there are no impediments to navigation. The spot was first selected as the capital, and as a town site it is unobjectionable, having a considerable tract of good cleared land in its neighbourhood, and all the requirements of a commercial port; the depth of water here is 10 fathoms. Large vessels may proceed with ease 7 miles beyond Langley; the navigation then becomes somewhat intricate, and the current too rapid for any vessels but steamers of light draught and great power. Above this there are numerous settlements on the banks of the river.

The **NORTH FORK** is another entrance to the Fraser, navigable for vessels drawing 6 or 8 ft. water, and is generally used by the natives proceeding to or from Burrard Inlet. Its junction with the main stream occurs immediately below New Westminster, from whence it runs in a westerly direction, and enters the Strait of Georgia through Sturgeon Bank, about 5 miles northward of the Sand Heads; a large low partially wooded island lies in its entrance, and splits the channel into two arms.

In many parts of the North Fork the water is deep, in holes, and the bottom irregular; it can only be considered a boat channel.

BURRARD INLET is the first great harbour which indents the shores of British Columbia North of the 49th parallel. It is the *Bras de Florida Blanca* of Galiano and Valdez. Its entrance, which is between Grey Point on the South and Atkinson Point on the North, is 14 miles N.N.W. from the Sand Heads of Fraser River, 21 miles N. by E. from Portier Pass, and 22 miles

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N.E. $\frac{3}{4}$ E. from Entrance Island of Nanaimo. Howe Sound immediately adjoins it on the North, *Atkinson Point*, the northern entrance point of the inlet, being the eastern limit of the sound.

The entrance of the inlet is well marked; *Grey Point*, a long wooded promontory terminating in a rounded bluff, is very conspicuous from the southward, while *Bowen Island*, which lies at the entrance of Howe Sound, and may also be said to form the northern boundary of the inlet, is very remarkable; its high round and almost bare summit, *Mount Gardner*, reaching an elevation of 2,483 ft., is easily recognised from any point of view. *Passage Island*, small but prominent, lies in the eastern passage of Howe Sound, midway between Bowen Island and Atkinson Point, and is an excellent mark from the southward; Anvil Peak, on with or just open westward of this island bearing N. by W. $\frac{3}{4}$ W., clears the edge of the Sturgeon Bank. A *telegraph cable* from Nanaimo is landed at Grey Point.

The **LIGHTHOUSE** on Atkinson Point is a square wooden building, 58 ft. high, showing a *revolving bright* light, attaining its greatest brilliancy once every minute, elevated 119 ft. above high water, and visible 14 miles. Lat. $49^{\circ} 19' 40''$ N., long. $123^{\circ} 16'$ W.

When in the vicinity of Fraser River, vessels will avoid Sturgeon Bank by not bringing this light to bear westward of North.

Burrard Inlet differs from most of the great sounds of this coast in being extremely easy of access to vessels of any size or class, and in the convenient depth of water for anchorage which may be found in almost every part of it; its close proximity to Fraser River likewise adds considerably to its importance. Owing to these advantages, and from its possession of unbounded pine forests, some saw-mills have been established here, which now produce large quantities of excellent timber, especially from the valuable Douglas pine, which is shipped to various parts of the world. Masts of this timber have been shipped which were 130 ft. long, and 42 inches in diameter, hewn octagonally. It is divided into three distinct harbours, viz., English Bay, or the outer anchorage, Coal Harbour above the First Narrows, and Port Moody at the head of the eastern arm of the inlet. The woods around it abound in deer, &c.

English Bay is more than 3 miles in breadth at the entrance between Grey and Atkinson Points, which bear from each other N.N.W. and S.S.E., and carries the same breadth for nearly its entire length or almost 4 miles; it is contracted in some measure, however, by *Spanish Bank*, dry at low water, which extends in a northerly direction from Grey Point three-quarters of a mile, and then curves easterly. The N.W. edge of the bank is marked by a red nun buoy, moored in 7 fathoms.

This anchorage is well protected from westerly winds by Spanish Bank, and as there is a good rise and fall of tide, as much as 16 ft. at springs, and a clean shelving sandy beach at the creek, it would be a desirable place to beach a

North Pacific.

ship for repairs. The head of English Bay on the South shore terminates in a shoal arm, named *False Creek*; on the North shore it leads by the First Narrows to Coal Harbour. A convenient anchorage will be found half a mile from the South shore of a small creek, near the centre of the bay, with the extreme of Coal Peninsula bearing N. by E., in 7 or 8 fathoms, or higher up if desired.

In 1881 it was announced that a valuable seam of coal had been discovered, cropping out on the face of a sandstone cliff in the Imperial Naval Reserve on English Bay, at 1 mile from Coal Harbour.

Vessels intending to pass above the Narrows must attend to the tides, and a stranger will do well to anchor in English Bay before proceeding higher up.

The *First Narrows* lie between the bluff of Coal Peninsula and the North side of the inlet, where the breadth of the channel is not more than $1\frac{1}{2}$ cable, with a depth of 12 fathoms. When at the entrance of the Narrows, the mid-channel course is E. by S. $\frac{1}{2}$ S. for $1\frac{1}{2}$ mile, when the broad inlet is again reached. The Narrows are half a mile long, and then gradually open out to half a mile in width, abreast of Brockton Point.

The strength of the tide in the narrowest part of the First Narrows is from 4 to 8 knots. The only directions necessary for a steamer are to keep the South shore aboard, and to be quick and careful with the helm; small craft may go through with ease, the tide being favourable; to a sailing ship a knowledge of the locality is necessary.

It is high water at Burrard Inlet, on full and change, at 6 p.m.; and the rise is 16 ft. The ebb stream commences directly it is high water by the shore, and runs out for two hours after it is low. There is consequently only 4 hours' flood stream.

COAL HARBOUR is on the South side of Burrard Inlet, 2 miles within the First Narrows, and, on the completion of the trans-continental Canadian Pacific Railway, of which Coal Harbour is to be the western terminus, it is expected to become of great importance. The Railway Company is negotiating for a large tract of land contiguous to Coal Harbour, English Bay, and False Creek, for the formation of wharfs, docks, and other shipping facilities. The city which is expected to arise here is to be named *Vancouver*. The railway will probably be completed early in the year 1886, the distance from Montreal being 2,862 miles, and it is calculated that the distance between Liverpool and Yokohama, Japan, will be shorter by 900 miles than via San Francisco. It is intended to establish a line of steamers to China, Japan, &c., on the railway being opened.

Gas Town, with about 200 inhabitants, is situated on the East side of the harbour, and a small steamer plies between this village and Moody saw-mills on the northern side of the inlet. At Hastings saw-mill, on the East point of the harbour, are several piers for the convenience of vessels loading lumber, with a depth of 25 ft. alongside the largest one. Wood for steaming purposes

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can be procured in abundance; the water is of bad quality. A powerful steam-tug is available for towing purposes between Juan de Fuca Strait and Burrard Inlet.

The seat of the greatest lumbering industries in the Province is Burrard Inlet, where are two large mills manufacturing for foreign exportation. The Hastings Saw-mill Company cuts about 15,000,000 ft. annually, frequently filling orders for special timbers of enormous size; some have been cut twenty-eight inches square and 110 ft. long. The Moodyville Saw-mill Company cuts nearly 20,000,000 ft. annually and employs about 100 men, having numerous electric lights for night work. Cargoes of lumber are sent to China, Australia, &c., and spars to England. Another mill is located at Port Moody.*

Coal Harbour is easy of access for vessels of the largest draught at all stages of the tide, and affords excellent landlocked anchorage. Vessels entering Coal Harbour from English Bay should keep the South shore of the First Narrows aboard within 2 cables, when past the narrowest part, until abreast *Brockton Point*, the West point of Coal Harbour, when steer E. by S. for half a mile to avoid *Burnaby Shoal*, a 9-ft. patch with kelp on it, lying 3 cables E. $\frac{3}{4}$ S. from the point. It is usually marked by a buoy, which is liable to break adrift. The houses N.W. of Brockton Point open North of that point leads North of the shoal.

Having cleared Burnaby Shoal, haul in South for the anchorage in 8 fathoms, at one-third of a mile from the shore. The best anchorage is in 10 to 12 fathoms, with the North extreme of the piers at Hastings Mill bearing E.N.E., and the long floating landing-stage at Gas Town, S. by W.; here a vessel will be out of the influence of the strong tidal streams. An islet lies near the centre of the inner western part of the harbour, and within this the harbour dries.

Between the First and Second Narrows, a distance of $4\frac{1}{2}$ miles, the course of the inlet is E. $\frac{1}{4}$ N., varying in breadth from half to $1\frac{1}{4}$ mile. The *Second Narrows* are similar to the First. On the North side is a bank similar to that on the North side of the First Narrows, but more extensive, caused by the deposit brought down from the high mountains by the numerous streams which empty themselves into the inlet on the North side. The channel is straight, and the tides which run from 3 to 7 knots set fairly through it. The only directions necessary are to keep the South shore close aboard, and steer from point to point.

Port Moody.—The entrance of this snug harbour is 4 miles eastward of the Second Narrows, at the head of the eastern arm of the inlet. It is 3 miles in

* Most of the above information, with much relating to other parts of British Columbia, has been obtained from the "West Shore," of September, 1884, published at Portland, Oregon. This number contains a very interesting account of the Province and its productions.

length, and varies in breadth from a third to half a mile, except at its entrance, where it is only 2 cables across; there are no dangers, and a uniform depth of water, with good holding ground. Abreast the turning point, and on the North shore, where it changes its direction from N.E. by E. $\frac{1}{2}$ E. to E. by S., a bank dries off it for nearly 2 cables at low water, on which good oysters are found. The best anchorage is in the widest part of the harbour, just before reaching the arm which turns E. by S., in 5 to 6 fathoms, about half a mile from the road leading to New Westminster. It was at first proposed to make Port Moody the terminus of the railway, but it has had to give way to the superior advantages of English Bay and Coal Harbour, at the entrance of the inlet. A wharf has been constructed here reaching into 26 ft. water.

North Arm, just before reaching Port Moody, and 3 miles above the Second Narrows, branches off from the main inlet, and runs in a general northerly direction for 11 miles. It is entirely different in its character from other portions of the inlet. The depth of water varies from 50 to 110 fathoms, and it is enclosed on both sides by rugged mountains rising from 2,000 to 5,000 ft. almost perpendicularly, and down the steep sides of which the melting snow in summer forces its way in foaming cascades, rendering the surface water in the inlet below all but fresh.

During the winter months *fresh water* is to be obtained in all parts of Burrard Inlet, and probably the whole year round there would be no scarcity; in June there is abundance at the creek in English Bay, off which is the anchorage. In Port Moody there is a fine stream close to the oyster bank.

SOUTHERN SHORE OF THE STRAIT OF GEORGIA.

GABRIOLA REEFS are a dangerous cluster of rocks, some of which cover at half flood, others having a few feet water over them. They lie 2 miles off the eastern point of Gabriola Island, mentioned on page 388, *ante*, 8 miles below the entrance of Nanaimo Harbour, and cover a space of half a mile. From the North point of Portier Pass, the outer extreme of the reef bears N.W. $\frac{1}{2}$ N. 8 miles; and from the easternmost of the Flat-top Islands, a group of low wooded islets lying close off the East end of Gabriola Island, E. $\frac{1}{2}$ S. $1\frac{1}{2}$ mile. On the largest ledge, which covers at 6 ft. rise of tide, is an iron *beacon*, 26 ft. high, surmounted by a cage, and painted black. There is a passage inside the reefs, but it is not recommended.

Thrasher Rock, at nearly 6 cables N. by E. $\frac{1}{2}$ E. from the beacon on Gabriola Reefs, and about 2 cables off the end of the reefs, has recently been found in the kelp; it dries $1\frac{1}{2}$ ft. at low water, spring tides, and between it and the reefs there appeared to be a depth of about 5 fathoms, rocky bottom. A conical *black buoy* is moored in $11\frac{1}{2}$ fathoms, 1 cable N.E. of the rock.

The marks most convenient for vessels coming from the southward are to keep the North and S.W. entrance points of Portier Pass just touching, on a bearing S.E. by S. $\frac{1}{2}$ S., which will lead more than a mile eastward, and working up Berry Point well open of Flat-top Islands, W. $\frac{1}{2}$ S., leads about 1 mile northward of Gabriola Reefs and Thrasher Rock. By night the light on Entrance Island forms a good mark for avoiding these dangers; when bearing W. $\frac{1}{2}$ S., it leads about a mile north-eastward of Thrasher Rock.

Westward of Flat-top Island the shore of Gabriola is bold until near Berry Point and Entrance Island, when it should not be approached within a long half mile. Foul ground extends for some distance eastward of the point of the island.

Entrance Island lies half a mile N.N.E. of Berry Point, the N.E. extreme of Gabriola Island. It is rocky, 30 ft. high, formed of sandstone, bare of trees, but has some vegetation on it. Vessels passing up the strait bound for Nanaimo should round this island. There is a deep passage between it and Berry Point named *Forwood Channel*, something more than 2 cables in breadth, which steamers and small craft may use; but the South and West sides of Entrance Island must be avoided, as reefs and broken ground extend 2 cables off them.

The **LIGHTHOUSE** on Entrance Island is a square wooden tower, 50 ft. high, painted white; from it is shown a *fixed bright* light, elevated 65 ft. above high water, and visible 14 miles. Latitude $49^{\circ} 12' 50''$ N., longitude $123^{\circ} 48' 45''$ W.

Having rounded this island at the distance of half a mile, or more if convenient, the entrance of Nanaimo Harbour will be distant 5 miles. There are three channels leading to the harbour, viz., Fairway, Middle, and Inner. Fairway Channel is the most convenient for vessels bound to Nanaimo from the southward or eastward; but Middle Channel is certainly the safest and most desirable for vessels from the northward.

Fairway Channel is the most direct for vessels entering from the southward or eastward. It lies between the shore of Gabriola and *Lighthouse Island*, which is a smooth-topped, grassy, sandstone island, 3 cables in extent North and South, about 60 ft. high, and bears from Entrance Island W. by S. $\frac{1}{4}$ S. 3 miles. A ledge of rocks, 4 cables long in a North and South direction, lies E.S.E. nearly half a mile from the island, with a depth of 9 ft. on its northern edge, and 20 ft. on its southern. The ledge is generally covered with streaming kelp, and has a channel of 7 fathoms water between it and the island; its North edge bears from the South point of Lighthouse Island N.E. by E. 3 cables, and its South end E.S.E., nearly half a mile.

The breadth of Fairway Channel between this ledge and Rocky Point of Gabriola Island is full three-quarters of a mile. For a distance of 2 cables off the latter point from 4 to 7 fathoms, rocky bottom, will be found, where occasionally kelp grows, but nothing exists which would bring a ship up. A mid-

channel course is recommended, which from a berth half a mile off Entrance Island is S.W. $\frac{1}{2}$ W. for 3 miles. The water is deep, and the bottom irregular, varying from 15 to 40 fathoms. If to the southward of mid-channel it will shoal to 15 fathoms, and shortly to 8 fathoms off Rocky Point.

Directions.—Having entered the Strait of Georgia, between East Point of Saturna and Patos Island, a W.N.W. course for 38 miles will lead nearly 3 miles outside Gabriola Reefs, and abreast Entrance Island, the latter bearing S.W., distant 5 miles. A vessel proceeding through Fairway Channel, if northward of mid-channel must keep a look-out for the kelp on Lighthouse Island ledge; when Lighthouse Island bears N.W. steer S. $\frac{1}{2}$ W., which leads for the entrance of Nanaimo Harbour, distant a little over 2 miles. Strangers should be careful not to mistake it for Northumberland Channel, which latter lies from Lighthouse Island in a S.S.E. direction, between the high cliffy West coast of Gabriola Island and *Sharp Point*, a remarkable narrow projection on the main, and off which, at the distance of half a cable, is a rock which uncovers.

Having passed between Lighthouse and Gabriola Islands, there is a good working space of $1\frac{1}{2}$ mile in breadth, between Gabriola on the East and Newcastle and Protection Islands on the West, but the water is too deep for anchorage. The shores of the latter islands should not be approached within a quarter of a mile, as shoal rocky ledges extend off them. Having brought Gallows Point, the southern extreme of Protection Island, to bear S.W. $\frac{1}{2}$ W., the town will open out.

A vessel may anchor, if necessary, with the high-water mark of Gallows Point bearing W.N.W., distant a quarter of a mile, which will be in the fairway of the entrance, but it is difficult for a sailing vessel to pick up a berth here with a strong breeze, as the space for anchorage is confined.

NANAIMO HARBOUR, when the banks are covered, gives the idea of a large sheet of water, but the deep part is limited. The entrance lies between Gallows Point and the southern bank. A rocky ledge extends for $1\frac{1}{2}$ cable on every side of the point, and in summer is marked by kelp; a large boulder stands on the ledge off the point, distant 150 yards, and covers before high water. The South side of the channel is the northern edge of the great shallow bay to the southward, which, although it does not quite dry in this part, has only 2 or 3 ft. on it at low water, and is steep-to. The entrance is here marked on either side by a buoy about a cable apart in a North and South direction; within them the harbour opens out, but in its centre is the *Middle Bank*, 2 cables long in a northerly direction, and half a cable broad, with a buoy on either end of it. Two narrow winding channels, the North and South, lead into the usual anchorage, which is close off the town, and westward of the Middle Bank. Both are buoyed in the vicinity of the latter, but no stranger should enter either channel without a pilot. The buoys are

conical, those on the North sides of the channels being *black* and bearing a 'all, and those on the South sides *red*, and bearing a triangle.

A remarkable white patch on the cliffy shore of Gabriola Island just open northward of the extreme of Sharp Point, the latter bearing E. by N. $\frac{1}{2}$ N., leads through the channel until near Gallows Point, which should be rounded at a little more than a cable's length. In the North channel two buoys will then be seen, a cable's length apart, the southern one on the North end of the Middle Bank, the North one on the South edge of Satellite Reef; steer about West to pass between them, then haul close round the southern buoy, and steer for the Mine Chimney. Anchor close off the town in 5 fathoms, midway between the buoy and *Beacon Rock*, which dries at low water, and has a *beacon* on it, consisting of a staff and ball. The South channel, though of sufficient depth for large vessels, has a somewhat sharp turn at its western end, but is very convenient for vessels leaving with a northerly wind, when they would be obliged to warp out of the North channel.

The town of Nanaimo, the second most important settlement on Vancouver Island, was founded by the Hudson's Bay Company, in 1852. It is situated on the shore of the bay, and now has an increasing population of over 2,000, mostly engaged in the mining and shipping of the excellent bituminous coal found in abundance in the locality. The coal is shipped from a wharf, supplied with chutes, which are capable of shipping 1,000 tons per day, being connected with the collieries by railway. Steam-tugs can be obtained for towing. There are also several other wharves here, a ship-yard, &c. A *telegraph cable* extends across the Strait of Georgia to Point Grey, thus connecting Vancouver Island with New Westminster, and the line across Canada; and it is intended to construct a railway to Esquimalt, as before stated.

COAL.—The mines of Nanaimo and Wellington produce a good bituminous coal, which answers well for steaming purposes. It is lighter by about 10 per cent. than Welsh coal, and its consumption is proportionately rapid, but from tests made by H.M. Ships, the War Department of the United States, &c., it has been found to be far superior to any other coal found on the coast. The demand for it is rapidly increasing. It is now exported to California in large quantities, over 169,000 tons having been shipped to San Francisco in 1880; about 120,000 tons were shipped to that port in 1883. Besides this, cargoes are also sent to the Sandwich Islands and China.

Besides being far superior to any that has yet been discovered or worked in this country, there can be little doubt but that this coal exists in sufficient quantities to supply the whole Pacific coast for almost an indefinite period.

DEPARTURE BAY.—A long narrow channel or arm between *Newcastle Island* and the main leads in a N.W. direction from Nanaimo Harbour to Departure Bay. It is $1\frac{1}{2}$ mile in length, and a cable in breadth, with 12 ft. at low water, except on a rock, which has only 2 ft. on it, lying in the centre,

2 cables north-westward of Rocky Point, the South point of Newcastle Island. A *red* buoy is moored on this rock, and a similar buoy is placed in 15 ft., on the N.E. edge of the bank extending off the entrance to *Mill Creek*. Vessels of 15 or 16 ft. draught may enter Departure Bay by this channel at suitable times of tide, but large vessels must enter northward of Newcastle Island. Coal is found on this island, and has been worked.

From Lighthouse Island, the entrance of Departure Bay bears S.W. $\frac{1}{2}$ W., distant 2 miles, and lies between the steep cliffy North point of Newcastle Island, and Jesse Islet to the northward of it. The breadth of this channel is 3 cables, and the depth 20 fathoms. Little less than this depth will be found in any part of the bay, and it is not nearly so sheltered as Nanaimo Harbour. The western edge of the shoal in the S.E. part of this bay, extending from the shore of Newcastle Island, is marked by a *red* beacon buoy moored in 6 fathoms, at $1\frac{1}{2}$ cable N.W. of the entrance to the channel leading to Nanaimo Harbour.

Vessels intending to load with coal (and there is no other inducement to anchor here), and having to wait for a cargo, should bring the steep North point of Newcastle Island to bear N. by E., and anchor in not less than 18 fathoms, off the coal mine, 2 cables from the shore; the bank runs up steep within this depth, and shoals from 12 to 2 fathoms. Unless anchored well out, a vessel is liable, with N.W. winds, to tail on the bank; and ships are not recommended to lie here after they have got their cargo in. A stranger should take a pilot for the coaling station in Departure Bay, either from outside or in Nanaimo Harbour.

Departure Bay has accommodation for a large amount of shipping, and there are usually numerous vessels here loading coal from the wharves, which have a depth of 5 to 7 fathoms alongside them, and are capable of supplying about 1,500 tons daily. Buoys are placed off the wharves, to enable vessels to warp alongside. The coal is brought by railway from the Wellington mines, about 5 miles inland.

Middle Channel lies between Lighthouse and *Five-finger Island*, $1\frac{1}{2}$ mile W.N.W. from it. The latter is a bare rugged islet of about the same dimensions as the former, but of trap formation, instead of sandstone; the five hummocks on it resemble knuckles more than fingers. The channel is perfectly free from danger, and has a depth of 80 fathoms.

S.S.W. of Five-finger Island are three smaller islets of similar character and formation, with some rocks about them which uncover. *Inner Channel*, 4 cables in breadth, lies between the above islets and the shore of the main, and being more direct than the channel between them and Five-finger Island, is convenient for steamers or small craft.

Tides.—It is high water at Nanaimo Harbour, on full and change, at about 5^h p.m., and the range of tide is sometimes 16 ft., which is as much as is met with anywhere on the coast, and makes this a most eligible spot for the con-

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struction of docks, for which it offers peculiar facilities. This great range of tide only occurs at midnight during winter, and in the daytime in summer. The superior and inferior tides exist here as they do at Esquimalt and among the Haro Archipelago. On the opposite coast, at Burrard Inlet, this irregularity does not exist.

NORTHUMBERLAND CHANNEL, before mentioned as lying between Sharp Point and the western shore of Gabriola Island, runs in a S.E. direction for $1\frac{1}{2}$ mile, and then East for 2 miles, when it enters the Dodd and False Narrows, the former on the South side of Mudge Island, the latter on the North; a rock which uncovers extends half a cable off the extreme of Sharp Point. *False Narrows* are shoal, with no ship passage, but there is excellent anchorage in 7 to 10 fathoms in *Percy Bay*, at their western entrance.

Dodd Narrows have already been described from the southward (p. 386). They communicate with the inner channels leading to the southern ports, and save a distance of 20 miles in the passage from Nanaimo to Victoria or Esquimalt.

The **STRAIT OF GEORGIA**, as already observed, commences at the northern end of the Haro Archipelago, and extends in a general W.N.W. direction to Cape Mudge, a distance of 110 miles. There are many harbours, both on the Vancouver and continental shores, and several islands, some of considerable size, form other channels, all of which are navigable.

The average width of the main strait westward of Nanaimo is about 9 miles, diminishing at its narrowest part between Lasqueti and the Ballinac Islands, to 5 miles. The general depth of water is great, frequently over 200 fathoms. The tides are not strong, and between Nanaimo and Cape Mudge there are few dangers in the way of ships navigating the strait.

The smaller channels on the continental shore are Malaspina Strait and Sabine Channel, the former lying between the continent and Texhada Island, the other separating Texhada from Lasqueti Island.

On the Vancouver shore is Ballinac Channel, lying westward of the islands of the same name; also Lambert Channel and Baynes Sound, the former between Hornby and Denman Islands, and the latter dividing both from Vancouver Island; they will be separately described.

Tides.—The meeting of the tides takes place between Cape Mudge and Cape Lazo; that is to say, the flood entering by Fuca Strait meets that entering by the North end of Vancouver Island, within 20 miles of the former cape, generally much nearer, but varying according to the phases of the moon and the state of the winds; and at the point of meeting a considerable race occurs, which would be dangerous to boats; there is generally such a race at the entrance of Discovery Passage. It is high water, on full and change, at Cape Mudge and Cape Lazo at about 5^h 30^m, and the range during ordinary springs is from 12 to 14 ft. At the entrance of the passage during springs the stream

runs as much as from 4 to 6 knots an hour, the flood or easterly stream being the strongest.

Winds.—In summer N.W. winds prevail in the Strait of Georgia, blowing strong and steadily during the daytime from May to September. In winter there is a good deal of moderate, calm, and gloomy weather, with frequent gales from S.E. and S.W.

NANOOSE HARBOUR, at 8 miles westward of Nanaimo, will be known by the remarkable hill called Nanoose or *Notched Hill*, which rises between 600 and 700 ft. immediately over its North side, and shows as a double or notch peak from the southward.

The shore westward of Nanaimo is free from danger, and at the distance of half a mile 20 fathoms will be found. Off the North point of the harbour lie a group of small wooded islands; the entrance is between *Maude Island* (the southernmost of them) and *Blunden Point*, on the South shore of the main, and is here nearly three-quarters of a mile in width. Westward of the latter a sand-bank dries a considerable distance off at low water. *Entrance Rock*, 2 ft. above high water, and $1\frac{1}{2}$ mile within Blunden Point, extends off a low maple flat on the South side almost into the middle of the harbour, and contracts the width of the entrance here to a quarter of a mile; within this the harbour opens out to nearly a mile in width, and terminates at the distance of $1\frac{1}{2}$ mile in a shoal mud flat, which dries at low water more than half a mile, and where abundance of oysters are found. The only danger on the North shore, in entering, is *North Rock*, which lies nearly 2 cables from the shore, and has 5 ft. on the outer part. It is a spacious and well-sheltered anchorage from all winds; with Nanoose Hill bearing North there is anchorage in 12 fathoms, near the centre.

Fresh water may be obtained from a cove at the head on the North side, and there is a convenient nook with a steep shingle beach, where a vessel might be laid for repairs, if necessary, on the same side, a mile from the head.

It is high water, on full and change, at 5^h p.m., and springs range 15 feet.

The COAST, for 6 miles westward of Nanoose, is strewn with numerous small islands and reefs, the latter generally marked by kelp. The outermost of them, *Winchelsea* and *Yeo Islands*, extend between 1 and 2 miles from the land, and beyond these there are no hidden dangers. *Grey Rock*, bare, 12 ft. above high water, and rather remarkable, lies 2 cables E.N.E. from the East end of the Winchelsea group.

Rudder Reef, with 6 ft. water on it, lies a quarter of a mile S.E. $\frac{1}{2}$ E. from Grey Rock, and has very little kelp on it. This reef must be avoided by vessels bound westward from Nanoose Harbour, and the S.E. end of the Winchelsea Islands should be given a berth of at least half a mile.

Ballinac Islands, two in number, are larger than the groups just described, and lie further off shore. They are about 250 ft. high; the northernmost one has but two or three trees, and its summit terminates in a sharp bare nipple;

the southernmost is wooded. They have the appearance of one island as seen from all points. The islands are steep and bold on all sides, and are conspicuous after passing westward of Nanaimo. Vessels bound through the Strait of Georgia would do well to steer for them.

Ballinac Channel lies southward of the islands, between them and the smaller group which extends off the coast westward of Nanoose. It is a safe, clear passage, $1\frac{1}{2}$ mile in width at its narrowest part, which is abreast Gerald Island. The depth in mid-channel is 136 fathoms, and the shores of the islands on both sides may be approached within a cable's length, if necessary. The only danger in the channel in working through is *Cottam Reef*, which has $2\frac{1}{2}$ fathoms on it; it is generally marked by kelp, and lies on the southern side. To steamers, coasters, or vessels with a fair wind, Ballinac Channel is recommended. With strong N.W. winds the water is far smoother here than in the channel northward of the islands.

North-west Bay is 5 miles westward of Nanoose. *Mistaken Island*, low, wooded, and half a mile long, lies immediately off its northern entrance point, and S.W. $\frac{1}{2}$ S. $2\frac{1}{2}$ miles from the North Ballinac Island. The bay indents the coast for 2 miles in an E.S.E. direction, making a peninsula of the land which separates it from Nanoose Harbour. It is much exposed to N.W. winds, and the water in it is very deep.

From North-west Bay the land trends, with a slight indentation, nearly West for 19 miles to Denman and Hornby Islands, and to the southern entrances of Baynes Sound and Lambert Channel. The land between Nanoose and the Komox or Comox district, a distance of 24 miles, is undulating, and of a moderate height from the sea-coast to the base of the mountain ranges, a distance of about 4 miles. There are large deposits of coal in the Comox district, and the neighbourhood of Baynes Sound. At the latter it is being worked.

Qualicum River empties itself on this coast, 30 miles westward of Nanaimo, and 5 miles eastward of the eastern entrance of Baynes Sound. It is a small stream, only noticeable as affording shelter to canoes or boats within its entrance, and as being the terminus of the trail between the head-waters of Barclay Sound and the eastern coast of the island, a distance of only 13 miles in a direct line. *Qualicum Bay* is a slight indentation of the coast, immediately West of the river, where very fair anchorage will be found in 8 or 10 fathoms, three-quarters of a mile from the shore.

The mountain ranges westward of Nanaimo are of considerable height, and very striking in their general features and varied outlines. Most conspicuous amongst them, and midway between Barclay Sound and the East coast, rises *Mount Arrowsmith* to a height of nearly 6,000 ft. Its remarkable summit, terminating in three sharp, well-defined peaks, is rarely free from snow.

Denman and Hornby Islands lie immediately off the coast, 34 miles westward of Nanaimo; the former is 9 miles long in a W.N.W. direction, or

parallel with the coast, low and generally wooded, with an average width of 2 miles.

Hornby Island is much smaller. Over its western side rises rather abruptly a remarkable flat-top hill, *Mount Geoffrey*, 1,070 ft. high; on its eastern side it falls gradually, and terminates in a low, bare grassy point. The eastern side is indented by *Tribune Bay*, affording good anchorage. On both these islands there is a considerable quantity of good land, particularly on the latter, also fresh water; and from the nature of the formation, it is probable that coal seams exist.

Denman Island is separated from the main by a good passage called Baynes Sound, and Hornby Island from Denman by *Lambert Channel*.

Yellow Island is small and bare, 80 ft. high, and generally of a yellow colour. It lies close off the S.E. point of Denman Island, is remarkable, may be seen for several miles, and is a good object to steer for coming from the eastward, as it forms the eastern entrance point of the sound. *Maple Point*, which forms the western, is also very remarkable; it lies S.W. by W. $1\frac{1}{4}$ mile from Yellow Island, and is low and covered with maples. A sand-spit, which dries at low water, and is rather steep-to, extends one-third of a mile from Maple Point.

BAYNES SOUND, separating Denman Island from the main, is a long narrow sheet of water, with an average navigable width something over half a mile, and with a general depth of 20 to 26 fathoms, so that vessels may, if necessary, drop an anchor in any part; there are, however, two very fair anchorages, *Fanny Bay* on the South or main side, and *Henry Bay* on the North or island side. At the distance of 14 miles from the eastern entrance of the sound is *Port Augusta*, into which flows *Courtenay River*, one of the largest streams in Vancouver Island, and in this immediate neighbourhood is a large extent of good clear grass land.

The exit into the Strait of Georgia by the N.W. entrance of the sound, between the North end of Denman Island and Cape Lazo, is nearly 2 miles in width, but a remarkable bridge or bar of sand, strewn with large stones, extends the whole way across, and at low water there is as little as 12 ft. on it (page 477). During summer it is thickly covered with kelp, which never altogether disappears. The bar is very narrow, and is always smooth. Towards high water vessels of 19 ft. draught may safely pass either into or out of the strait by this channel.

The East and West entrances to Baynes Sound are marked by spar buoys. Vessels entering by either channel should leave black buoys on the starboard hand, and red buoys on the port hand, giving them a berth of half a cable.

Deep Bay.—Maple Point, from the extremity of the trees, turns sharp off at a right angle to the W.S.W. for half a mile, and forms a low sandy spit, in shape resembling the long beak of a bird; within this is Deep Bay, in which the depth varies from 15 to 20 fathoms, irregular bottom, but sandy. It is a

small, and not very desirable anchorage; the best berth is in 14 to 16 fathoms, about $1\frac{1}{2}$ cable East of the spit, and near the centre of the bay.

Fanny Bay, on the southern side of the sound, 4 miles within Maple Point, affords a good though somewhat limited anchorage. Base Flat, the delta of a considerable stream, having its rise in the Beaufort range of mountains, forms its western point; and Ship Point, a bold wooded bluff, its eastern. Entering from the eastward, give Ship Point, and the coast of the peninsula immediately eastward of it, a berth of a quarter of a mile, and anchor in 12 or 13 fathoms in the middle of the bay.

Village Point, on Denman Island, with a large native settlement on it, is remarkable; it is 2 miles N.W. of Fanny Bay, and a sand-spit extends a short distance off it.

Henry Bay.—Denman Island, towards its N.W. end, falls away into a remarkable wedge shape, terminating in a singular sharp beak-shaped extremity called *Beak Point*; the hollow of this beak, on the N.W. side of the island, forms Henry Bay, which is nearly 6 miles from Fanny Bay, and is a safe and convenient anchorage, though, like the latter, it is somewhat limited in size. There is anchorage in 9 or 10 fathoms, in the centre, a quarter of a mile from the beach, where there is a large Indian village.

From Beak Point a series of sand-banks, some of them above water, others covered, extend in a N.N.W. direction for a little more than 2 miles. *Sandy Island*, the largest of them, is two-thirds of a mile from the point, and 6 ft. above high water, with large boulder stones dispersed over it; there is a good boat passage through at half tide. North-west of Sandy Island, and the same distance, is *White Spit*, which almost covers, and is very remarkable from the number of clam shells collected on it, giving it the appearance of a white sandy beach; it is also connected with Sandy Island at very low tides.

Kelp Bar.—The end of the shoal, which occasionally dries in patches, extends two-thirds of a mile N.W. of White Spit, and from it commences the remarkable kelp bar or bridge before mentioned (page 476), which connects Denman Island with the land about Cape Lazo, distant nearly 2 miles. The bar is composed of sand, interspersed with large boulders, which can be seen at low water. Great quantities of kelp grow on it during summer, and it is rarely entirely without it. To cross the kelp bar over its narrowest part and in the deepest water, 15 ft. at low water, a vessel should stand $2\frac{1}{2}$ miles through the sound, north-westward of Henry Bay, until a rather remarkable white beach (on the western shore, West 3 miles from Beak Point) is brought to bear S. by W. $\frac{1}{2}$ W., then steer out boldly N. by E. $\frac{1}{2}$ E. The entrance is marked by spar buoys, as before stated.

On White Beach leading marks, consisting of white-washed planks attached to trees, have been erected. When in line they present the appearance of an upper and lower cross, which may be seen from a distance of 6 miles, and lead across the bar in not less than 12 ft. at low water.

Port Augusta, in the N.W. corner of Baynes Sound, although apparently a large sheet of water, its upper part is a mud flat, which almost dries at low tides, and is formed by the Courtenay River, which flows into it. There is a village here, connected with Victoria by steamer, and at 3 cables from it is a saw-mill.

From White Bluff, before mentioned, a remarkable elbow-shaped tongue of land, named *Goose Spit*, projects to the southward and westward; it is grassy, with one or two hillocks, and bare, with two small clumps of trees. *Goose Spit* forms the northern entrance point of the port, and *Grassy Point* the southern; the latter is very low and swampy, the delta of a considerable stream. Off it, at low water, sand and boulders dry for 2 cables, and the water shoals suddenly from 10 fathoms to 6 ft. at the distance of $3\frac{1}{2}$ cables, leaving a width of less than a mile between the entrance points.

Within *Goose Spit* is an excellent place for anchorage, in 14 fathoms, with a S.E. gale, though no sea to speak of could get up in any part of Port Augusta.

Courtenay River is a deep and rapid mountain stream, but on account of falls and other obstructions is only navigable for a few miles for boats and canoes; it has its rise in Mount Washington, having a considerable extent of rich grass country on either side.

Mount Washington is remarkable, and rises to 5,410 ft.; it is the westernmost of a range 10 miles in length, terminating in *Mount Becher* to the East; to the southward and westward of it are several high mountain ranges and peaks from 4,000 to 7,000 ft. above the sea, the highest summits being covered with snow all the year round.

The *Beaufort Range* rise on the western side of Baynes Sound, 7 or 8 miles from the coast, and stretch for 12 miles in a W.N.W. and E.S.E. direction, varying in elevation from 4,500 to 5,400 ft.; they are very remarkable, presenting seven or eight distinct summits, which are rarely free from snow. This range, together with Mount Washington, form the eastern boundary of the great central valley and chain of lakes which run through the length of Vancouver Island from the head of Barclay Sound.

Lambert Channel, between Denman and Hornby Islands, is a safe passage running 6 miles in a W.N.W. and N.W. direction. It is a mile wide at its southern entrance, gradually increasing to the N.W. as it opens into the Strait of Georgia. The general depth of water is from 24 to 30 fathoms, shoaling to 16 fathoms on either side within 2 cables of the shore. Coming from the southward, Yellow Island marks the western entrance point, while *Mount Geoffrey*, a remarkable flat-top hill, 1,070 ft. high, on Hornby Island, rises over the eastern side of the channel; either of these may be steered for until approaching the entrance, when W.N.W. is a mid-channel course through.

On the eastern side is *Norris Rock*, of considerable extent at low tide, but

at high tide, a mere patch 5 or 6 ft. above water; it lies N.E. $\frac{1}{2}$ N. $1\frac{1}{2}$ mile from Yellow Island.

The eastern side of Lambert Channel, between Norman Point and Shingle Spit, a distance of 2 miles, has two groups of covering rocks, extending nearly 2 cables off, and the shore should not be approached within a quarter of a mile. *Shingle Spit* is a remarkable low point on the eastern side of the channel, 2 miles within Norman Point.

Off the North end of Hornby Island stands a remarkable boulder rock, 7 or 8 ft. high, with smaller ones near it, and vessels should not approach the shore in this neighbourhood within a long half mile, at which distance there is 7 to 10 fathoms.

Tribune Bay, on the S.E. side of Hornby Island, affords good anchorage with all but easterly or south-easterly winds, to which it is quite open. It is easy to enter or to leave, and conveniently situated as a stopping-place for vessels bound either way, being 35 miles West of Nanaimo, and 40 miles eastward of Cape Mudge and the entrance of Discovery Channel.

The eastern end of Hornby Island terminates in a rather remarkable point, called *St. John*, grassy, and bare of trees. Off it, in a S.S.E. direction, are two or three small low islets. Some reefs which generally break extend nearly half a mile outside the islets; these should be given a berth, and it is not recommended to pass nearer than half a mile to the N.E. coast of Hornby Island.

The outermost of the dangers off the West point of Tribune Bay, is a 1-fathom rocky patch, called the *Nash Bank*, which must be carefully avoided. It is a quarter of a mile in extent, and lies N.E. by E. nearly a mile from Point Downes, the western entrance point, and S.W. by S. from the largest and outermost of the low islets off Point St. John. With a leading wind it is recommended to pass the eastern side of the bay within a short half mile, and to steer up for the white sandy beach as soon as it is open, anchoring with the eastern bluff of the bay bearing E. by N. $\frac{1}{2}$ N., 3 or 4 cables from the eastern shore, in 9 fathoms, sandy bottom. There is anchorage, if desired, in 4 fathoms, much closer in.

CAPE LAZO will be seen after passing the eastern end of Hornby Island, from which it bears W.N.W., distant 15 miles. It is a remarkable salient point about 250 ft. high, flat and grassy on its summit, but wooded behind, and falling abruptly to the sea in yellow clay cliffs. Although a bold-looking headland, shoal water extends a considerable distance off, and it is recommended not to approach its eastern and S.E. sides nearer than 2 miles, as only $4\frac{1}{2}$ fathoms, uneven bottom, is found at the distance of $1\frac{1}{2}$ mile.

Mittlenatch Island, at 16 miles N.W. of Cape Lazo, is half a mile in extent, 200 ft. high, bare and peaked. Between it and the Vancouver Island shore, distant nearly 6 miles, is the fair channel to Cape Mudge and Discovery Channel.

Oyster Bay.—From Cape Lazo the coast trends W.N.W., is moderately high, and slightly indented with boulder beaches, which makes boat landing attended with danger unless in very calm weather. At the distance of 15 miles is *Kuhushan Point*, the southern extreme of a large but not very deep indentation, named Oyster Bay; *Shelter Point*, nearly 4 miles W.N.W. from Kuhushan, is its northern extreme. There is fair anchorage in 10 or 12 fathoms in this bay for vessels waiting wind or tide. A reef extends half a mile eastward of Shelter Point. At 4 miles north-westward of Oyster Bay is the entrance to Discovery Passage.

CAPE MUDGE is one of those peculiar headlands so frequently met with on this coast, and resembles Point Roberts and Cape Lazo, except that the yellow clay cliff which forms its face is more covered with vegetation. The cape is between 200 and 300 ft. high, flat, and wooded on its summit, falling to the westward as it enters Discovery Passage with a low boulder point. The high land of Valdes Island appears behind it from the south-eastward. A boulder beach extends in a semi-circular form from it to the eastward, and at the distance of 2 miles in this direction the depth is not more than 5 fathoms. The western low part of Cape Mudge should not be brought westward of W.N.W. in entering or leaving Discovery Passage.

DIRECTIONS.—The southern shore of the Strait of Georgia, with its anchorages and smaller channels, having been now described, a few remarks will be offered on the navigation of the main strait.

From the coast of Gabriola Island abreast Nanaimo, to the opposite shore of the continent, about Burrard Inlet, the width of the strait is 14 miles, the navigation free from danger, and the strength of the tide between 1 and 2 knots an hour. Coming from the southward, *Mount Shepherd*, on the South end of Texhada Island, is a very remarkable object, and shows as a high solitary peaked island standing in the middle of the strait; it is 2,900 ft. in elevation, and is plainly seen in clear weather more than 30 miles off.

Proceeding westward, the long and comparatively low island of Lasqueti rises above the horizon, its singular bare turret-shaped summit, 1,000 ft. high, presenting an unmistakeable feature. The Ballinac, and smaller islands westward of them, will now soon be made out. When abreast the former, the width of the channel contracts to 4 miles between them and the small island of Sangster, off the S.E. end of Lasqueti; after which it opens out again to 7 miles, and the rather remarkable flat-topped Mount Geoffrey on the West end of Hornby Island will be plainly seen. The southern coast of Lasqueti is bold, with no dangers off it which are not seen, except Seal Rocks, which cover at half tide, and lie $1\frac{1}{2}$ mile West of Sangster Island; off its West end are the small groups of Flat and Bare Islands, but no hidden dangers. False Bay, which indents its West end, is exposed, and not recommended as an anchorage.

Sisters Islets are the next remarkable objects; they are two small black

rocks 10 ft. above high water, S.W. by S. from the West point of Lasqueti, with a deep water channel over a mile wide between them and Flat Islands. When abreast the Sisters, the main strait turns to the N.N.W. between them and Hornby Island for 4 miles, and then resumes its original trend to the W.N.W. The distance between the Sisters and Point St. John, the low bare East point of Hornby Island, is 5 miles; the latter, with the small islets off it, should be given a berth of nearly a mile. The Sisters are bold on all sides, but should not be approached too close in calm or light winds, as the tide sets straight past them. Having passed Point St. John, the distance to the entrance of the Discovery Passage is 38 miles. The strait maintains a uniform width of 9 miles, until near Mittlenatch Island, or for 30 miles, the only stopping places being Oyster Bay, already described, 4 miles from Cape Mudge, and Gillies Bay, on the West side of Texhada Island. The shore of Texhada Island is bold.

NORTHERN SHORE OF THE STRAIT OF GEORGIA.

HOWE SOUND was thus named by Vancouver after Admiral Earl Howe, and was called Brazo de Carmelo by Galiano and Valdes. It is immediately adjoining Burrard Inlet (page 464) on the North, and is an extensive though probably useless sheet of water, the general depth being very great, while there are but few anchorages. It is almost entirely hemmed in by rugged and precipitous mountains, rising abruptly from the water's edge to elevations of from 4,000 to 6,000 ft. There is no available land for the settler, and although a river of considerable size, the *Squawmisht*, navigable for boats, falls into its head, it leads by no useful or even practicable route into the interior of the country. Copper has been found here.

The entrance is between Atkinson Point, the North point of Burrard Inlet, and Gower Point, nearly 12 miles apart. The sound penetrates the continent in a northerly direction for 20 miles, and although of such considerable width for nearly 12 miles of its length, yet it is choked by some large and numerous smaller islands, between which are several ship passages. *Bowen Island*, the largest and easternmost, is remarkable, its highest summit rising to nearly 2,500 ft., being round, smooth, and partially bare, unmistakably pointing out the entrance from any direction; the island is 7 miles in length in a northerly direction, and more than 3 miles in width.

Queen Charlotte Channel, the easternmost passage into Howe Sound, is between Bowen Island and Atkinson Point; *Passage Island*, half a mile long only, but very prominent from the southward, stands in the centre of the channel and on either side of it is a deep water passage. A tide ripple is

North Pacific.

frequently met with off Atkinson Point, caused by the meeting of the ebb streams from the sound and Burrard Inlet.

Snug Cove.—At $1\frac{1}{2}$ mile northward of Passage Island, and on the eastern shore, is White Cliff Point, and opposite, on the Bowen Island shore, distant $1\frac{1}{2}$ mile, is a double-headed cove. Snug Cove, the southernmost of these, though narrow, affords excellent anchorage to small craft in 9 fathoms, sheltered from all winds; *Deep Cove*, the northernmost, is larger, but with a S.E. wind, when anchorage would be most required, a swell would set in.

Vessels bound to *Port Graves*, on the South side of Gambier Island, which is the principal anchorage in the sound, should pass westward of Bowyer Island between it and Hood Point, the North point of Bowen Island. The latter is a rather remarkable low flat peninsula point, with a small high cliffy island lying off it.

Bound up the sound by Queen Charlotte Channel, a N.N.W. course leads mid-channel; pass eastward of White Rock, Centre Island, and Anvil Island, through Montagu Channel. *White Rock* is a small but remarkable islet, 30 ft. high. *Anvil Island* is oval-shaped, and 3 miles long, and its summit, *Leading Peak*, 2,746 ft. high, and very remarkable, resembles the horn of an anvil pointed upwards. From almost all parts of the Strait of Georgia, this peak appears as a most prominent object; it is an excellent leading mark to clear the shoals off the Fraser River by being kept just open westward of Passage Island, on a N. by W. $\frac{1}{2}$ W. bearing.

Montagu Channel, 5 miles above Bowyer Island, and between Anvil Island and the eastern shore, is a mile wide, and over 100 fathoms in depth, trending first to N. by W. for 7 miles, when it runs to the eastward for a further distance of 4 miles, terminating in a low delta, through which flows the *Squawmisht River*. The sound carries its depth to the head and shoals from 100 fathoms suddenly to 2 fathoms.

Collingwood Channel, to the westward of Bowen Island, between it and the group of smaller islands which stud the centre of the sound, is the most direct route to Port Graves. In entering both shores are steep and bold; the direction of the channel for 4 miles is North, its width about a mile, and the general depth varies from 50 to 100 fathoms. The small islands forming the western side have no dangers but what are visible, except *Passage Rock*, which lies almost midway between Worlcombe and Pasley Islands, and covers at half tide.

Barfleur Passage lies to the westward of the central group of small islands, between them and Keats Island. It is a safe ship channel, but not quite so wide as the one last described. A rock, which breaks at low water, extends $1\frac{1}{2}$ cable into the channel westward from the second of the islands in the entrance. The passages between the small islands are not recommended to be used unless by coasting vessels.

Shoal Channel, the westernmost entrance to Howe Sound, is between Keats

Island and the mainland of Gower Point. It is convenient for vessels coming from the westward, and leads to Plumper Cove, a snug anchorage on the N.W. side of Keats Island.

The South point of Keats Island, which forms the eastern point of entrance to the channel, has a small but prominent and thickly wooded island lying close off it, Home Island. From a little within this island a bar of sand and shingle extends quite across the channel to the steep cliffs of the mainland; the greatest depth over it, at low water, is 15 ft., and that in the centre of the passage, which is here half a mile in width. The width of the bar in the centre is not over a quarter of a mile.

Plumper Cove.—Immediately after crossing the bar of Shoal Channel, the water deepens to 20 fathoms, and two small islets, partially wooded, and almost joined at low water, will be seen N.N.E. a mile off; between them and the shore of Keats Island is Plumper Cove, which is perfectly secure with all winds, and however hard it may be blowing outside, it is generally a calm here.

Thornborough Channel is a continuation of the one just described, and leads up the western side of the sound, between Gambier Island and the main. Its direction after passing Plumper Cove is N.N.W., and at the distance of 6 miles is *Woolridge Island*, rather on the eastern shore; the wider channel lies westward of this island, but there is over 100 fathoms of water through *Latona Passage* to the eastward of it. Passing Woolridge Island, the arm turns to the north-eastward, and northward of Anvil Island leads to the head of the sound.

Gambier Island, lying in the centre of the sound, immediately northward of Bowen Island, is almost square-shaped, and 6 miles in extent either way. On its western side rise two very remarkable cone-shaped mountains, over 3,000 ft. in elevation; the southern face of the island is indented by three very deep bays or inlets, in the easternmost of which only is convenient anchorage found. *Port Graves*, the easternmost of the three bays on the South side of Gambier Island, is the principal anchorage in Howe Sound. It is about 8 miles from the entrance, and may be reached with great facility by either of the channels already described; its entrance will not, however, be very apparent to a stranger, until closing Hope Point, which forms its eastern side. At two-thirds of a mile within the entrance a shingle spit extends a short distance off the West side; when within this spit there is anchorage anywhere in 10 fathoms, but half a mile or more inside it, in 7 fathoms, is the best berth.

The Coast from Gower Point, the western entrance of Howe Sound, trends W. $\frac{1}{2}$ S. for 18 miles to the entrance of Malaspina Strait, and is free from danger. *White Islet*, a bare rock, 50 ft. high, lies $1\frac{1}{2}$ mile from the shore, 6 miles westward of Gower Point, and is remarkable, always showing very white; there is deep water close to and inside it. At 4 miles N.W. of this

islet the coast recedes and forms *Trail Bay*. There is a very marked drop in the land at the head of this bay, across which, by a portage of 1,100 yards, the natives carry their canoes into Seechelt Arm, one of the many arms of Jervis Inlet. Trail Islets, four in number, lie something more than half a mile off the western end of this bay.

Thormanby Islands, two in number, almost joined, and upwards of 2 miles in extent, are 18 miles from Gower Point, and form the S.E. entrance point of Malaspina Strait.

TEXHADA or *Favida Island*, lying parallel with and on the eastern side of the Strait of Georgia, is 27 miles in length, with an average width of scarcely 4 miles. Throughout its whole length stretches a ridge of rugged trap mountains, wooded generally to their summits. At the southern end, *Mount Shepherd* reaches a height of 2,900 ft. Towards the northern end, the range decreases in elevation, but there is scarcely an acre of cultivable land throughout the island. Its shores are steep and bold on all sides, and the land rises abruptly, except at the North extreme.

The only anchorage, and that merely a stopping-place, is *Gillies Bay*, on the S.W. side, nearly 18 miles north-westward of its South end. It will be known by a remarkable white patch on its northern point. An anchor may be dropped in 12 fathoms, at a quarter of a mile from the beach, but it is only a stopping-place.

There are some deposits of rich iron-ore on this island, which are mined and the ore shipped to the smelting works at Port Townshend. It has been proposed to erect a furnace on the island, the coal for which could easily be obtained from the Comox district, or Nanaimo.

LASQUETI ISLAND lies parallel with Texhada, at its S.E. end, and is separated from it by a channel about a mile in width. Its length is 9 miles, its average width something more than 2 miles, and it is remarkable from a singular turret-shaped summit 1,050 ft. high, called *Mount Tremeton*, rising nearly in its centre. On its southern side are several boat coves, and in *Tucker Bay*, on the northern, there is very fair anchorage, with some good land in the neighbourhood. *Sangster Island*, half a mile long, lies S.S.W. a mile from Young Point, the eastern extreme of Lasqueti.

Jenkins Island lies 3 miles westward of Sangster, and close to the South shore of Lasqueti; Seal Rock lies about midway between. *Sea Egg Rocks*, always uncovered, lie 3 cables off the West end of Jenkins Island.

STEVENS PASSAGE, between Sisters Islets and Lasqueti, is upwards of a mile wide, and perfectly safe and clear. *Flat Islands*, on its eastern side, should be given a berth of a quarter of a mile.

SABINE CHANNEL, between Texhada and Lasqueti Islands, is a good ship passage 9 miles long, in nearly an East and West direction, with very deep water; its breadth at the western end is 3 miles, but several high conical islands lying off the N.E. side of Lasqueti contract the width at the eastern

end, in some parts to three-quarters of a mile. There is also a narrow but deep channel, *Bull Passage*, to the southward of these islands, by keeping close along the Lasqueti shore. *Tucker Bay*, on the North side of Lasqueti, and equidistant from either end, is a very fair anchorage.

MALASPINA STRAIT is a wide navigable channel, separating Texhada Island from the mainland. Its general direction is W.N.W. for 30 miles, when it again enters the Strait of Georgia* between Marshall Point, the N.W. extreme of Texhada, and Harwood Island; its southern entrance lies between Upwood Point, the S.E. extreme of Texhada, and the western of the Thormanby Islands, and is 4 miles in width.

Upwood Point is rugged and precipitous; stunted pines grow between the crevices of the bare trap rock, the land behind is more thickly wooded. Almost immediately over it rises *Mount Dick*, a very remarkable hump-shaped hill, 1,130 ft. high, and 3 miles within is *Mount Shepherd*, the highest summit of the island. A covering rock lies 2 cables off the point.

Thormanby Islands, before mentioned, lying close to the mainland, and appearing as part of it, terminate at their N.W. point in a steep clay cliff, off which, at low water, dries a boulder point. The Texhada shore is bold, and almost straight for its whole length, fronted by narrow shingle or boulder beaches.

JERVIS INLET† is one of the most considerable of those numerous and remarkable arms of the sea which indent the continent of America from the parallel of Fuca Strait as far as lat. 60° N. It extends by winding reaches in a northerly direction for more than 40 miles, while its width rarely exceeds 1½ mile, and in most places is even less.

Neither in a commercial point of view, as a refuge for shipping, nor as a means of communication with the interior of the country, does it appear likely ever to occupy any very prominent place, as it is hemmed in on all sides by mountains of the most rugged and stupendous character, rising from its almost perpendicular shores to five, six, and sometimes eight thousand feet. The hardy pine, which flourishes where no other tree can find soil to sustain

* It was in this part that Vancouver met, to his great surprise and mortification, with the two Spanish surveying vessels which had preceded him. These were the brig *Sutil*, under Don D. Galiano, and the schooner *Mexicana*, under Don C. Valdes, detached from the commission under Malaspina, from whom, however, he met with the most polite and friendly attention.

† Jervis Canal, or Inlet, named by Vancouver after Admiral Sir John Jervis, is the Brazo de Mazarredo of Galiano and Valdes. Commander R. C. Mayne, R.N., attached to the survey under Capt. G. H. Richards, made his way through the dense forest and thickets between the head of Jervis Inlet and Port Pemberton, on the Fraser River, in July, 1860, the details of which arduous journey are given in his interesting work, Chapter IX. It was thought that this might be a good route from the coast to the upper part of the Fraser, but this journey dispelled any such a notion.

life, holds but a feeble and uncertain tenure here; and it is not uncommon to see whole mountain sides denuded by the blasts of winter, or the still more certain destruction of the avalanche which accompanies the thaw of summer. Strikingly grand and magnificent, there is a solemnity in the silence and utter desolation which prevail here during the months of winter; not a native, nor a living creature to disturb the solitude, and though in summer a few miserable Indians may occasionally be met with, and the reverberating echo of a hundred cataracts disturb the silence, yet the desolation remains, and seems inseparable from a scene which nature never intended as the abode of man. The depths below almost rival the height of the mountain summits; bottom is rarely reached under 200 fathoms, even close to the shore, and frequently at much greater depths; there are a few spots where vessels may drop an anchor, but they are either open and exposed, with an inconvenient depth of water, or from the narrowness of their entrance are only adapted to steamers or coasting vessels.

In the Vancouver Island Pilot, the various channels and shores are described at length, but as there appears to be but little to interest general commerce in this remarkable fiord, we shall make but brief extracts therefrom.

The entrance of the inlet is between Francis Point and Scotch Fir Point, which are 12 miles apart in a W.N.W. direction. Nelson Island lies immediately in the centre, and divides it into two channels, the westernmost being the principal one.

Agamemnon Channel, the eastern entrance to the inlet, is 9 miles N. by W. from Point Upwood. After running between Nelson Island and the main in a general northerly direction for 9 miles, it joins the main channel of the inlet. Its average width is little more than half a mile, the tides run from 1 to 3 knots, the depth of water varies from 50 to 100 fathoms, and it affords no anchorage. There are three passages into Agamemnon Channel. The middle, between Channel Islets and Pearson Island, and the easternmost between the latter and Martin Island. The passages are about the same width, something over a quarter of a mile, and have deep water. Vessels entering by the western passage, or coming from the westward along the shore of Nelson Island, must avoid *Nile Rock*, which covers at quarter flood, at a mile S.W. by W. $\frac{1}{2}$ W. from Fearney Point, the S.E. point of Nelson Island, and the same distance West from the largest Channel Islet.

Fender Harbour is the only anchorage deserving the name, with a moderate depth of water, to be found in the neighbourhood of Jervis Inlet, and its entrance is so encumbered by islands as to render it difficult of access to anything but steam or coasting vessels; it immediately adjoins Agamemnon Channel on the South, and lies E.N.E. three-quarters of a mile from Pearson Island, indenting the coast for 3 miles in the same direction.

The Western Entrance of Jervis Inlet is between Alexander Point, the

South extreme of Hardy Island, on the East, and Scotch Fir Point on the West. The points are not remarkable, but the opening is readily made out; it is nearly 2 miles in width, and takes for a short distance a N.N.W. direction. *Scotch Fir Point* is rocky, and has two small islets lying close to the westward of it, which, like the point itself, are covered with stunted pines. *Thunder Bay*, formed on the western side, $1\frac{1}{2}$ mile above Scotch Fir Point, is one of the few spots in Jervis Inlet where a vessel may drop an anchor, and, being near the entrance, is likely to prove convenient.

Nelson Island, in the middle of the entrance to Jervis Inlet, is 10 miles long in a northerly direction, and about 4 or 5 miles wide. The island is mountainous, the summits ranging from 500 to 1,500 ft. in height. *Cape Cockburn*, its S.W. point, is of white granite, about 80 or 90 ft. high; a rock lies 1 cable South of it.

Prince of Wales Reach.—*Dark Cove*, which affords a snug anchorage on the West side of Jervis Inlet, within Sydney Islets, is 2 miles North of Captain Island, and 12 miles from the entrance. *Vancouver Bay*, on the East side of the inlet, 19 miles from the entrance, is about half a mile in extent, and of square shape.

Princess Royal Reach.—*Deserted Bay*, also on the East side of the inlet, at the termination of Princess Royal Reach, and about 37 miles from the entrance, is small, and affords an indifferent anchorage in its eastern part. A valley extends from the head of the bay to the N.E., through which a trail runs to the Lilloet Lakes on the Fraser River, and is much frequented by the natives in the summer season.

Queen's Reach.—The head of Jervis Inlet terminates in a patch of low swampy land, through which flow some small streams; it does not afford any anchorage, there being 25 fathoms within half a cable of the outer edge of the bank. A remarkable peak, *Mount Victoria*, rises 2 miles North of the water's edge to a height of 7,452 ft., and is a very conspicuous object on approaching the head of the inlet. *Princess Louisa Inlet*, on the East side of Jervis Inlet, 5 miles below the head, is narrow, and about 4 miles long in an E.N.E. direction, with deep water.

Seechelt Arm, the entrance to which is on the East side of Jervis Inlet, 1 mile North of Agamemnon Channel, is an extensive arm of the sea, penetrating the land for 17 miles in a south-easterly direction towards the Strait of Georgia, and only separated from the latter by a low neck of land 1,100 yards wide, forming an extensive mountainous peninsula to the westward, called Seechelt Peninsula. A short distance within the entrance are some extensive rapids.

Tides.—It is high water in Jervis Inlet, on full and change, at 6^h, the rise and fall being about 14 ft. Within Seechelt Inlet the rise and fall seldom exceeds 6 or 7 feet.

Harwood Island, off the West entrance to Malaspina Strait, $1\frac{1}{2}$ mile from

the continental shore, and about 3 miles N.W. of Point Marshall, is $2\frac{1}{2}$ miles long in a northerly direction, and $1\frac{1}{2}$ mile wide, from 150 to 200 ft. high, flat, and thickly wooded. There is deep water between the island and the shore.

Westward of Jervis Inlet, the North shore of Malaspina Strait runs in a westerly direction for 11 miles, terminating at *Grief Point*. For a considerable distance inland it is low, and bordered by a sandy beach. There are no off-lying dangers that are not seen. From Grief Point the North or continental shore of the Strait of Georgia runs in a W.N.W. direction for nearly 20 miles almost straight to Sarah Point, the S.E. entrance point of Desolation Sound.

Savary Island, nearly 6 miles W.N.W. of Harwood Island and 1 mile from the continental shore, is 4 miles long in a W.S.W. direction, but narrow. A sandy beach, strewed with huge boulders, surrounds it, and extends a considerable distance off its North and West sides, which should not be approached nearer than half a mile. The height of the island varies from 80 to 120 ft., and the South side is faced by some remarkable white sandy cliffs, very conspicuous from the S.E. Its East extreme is a granite cliff, steep-to. A sandy bar or ledge, of 1 to 2 fathoms water, extends from its West point to Hernando Island. *Hurtado Point*, on the main abreast Savary Island, is about 250 ft. high, bold and cliffy.

Mystery Rock, about $2\frac{1}{2}$ miles S.E. $\frac{1}{2}$ E. from the East end of Savary Island, is of small extent, uncovers 4 ft. at low water, and lies near the South end of a shallow bank extending from the island. Vessels, therefore, in navigating this locality should observe great caution. In going between Savary and Harwood Islands, but by keeping within half a mile of the continental shore this danger will be avoided.

Ragged Islands, close to the continental shore, and running parallel to it, are a rocky group of small islands $2\frac{1}{2}$ miles long; their S.E. part is about $2\frac{1}{2}$ miles N.W. of Hurtado Point, and some rocks extend 4 cables from their N.W. extreme. *White Islet*, a mile to the S.W. of them, is a very remarkable bare white granite rock, about 70 ft. high. A rock, which uncovers at low water, lies 1 cable East of it.

Sarah Point, at 20 miles W.N.W. of Malaspina Strait, may be called the N.W. entrance point of the Strait of Georgia. It is a rounding rocky point, sloping gradually to the sea from a height of about 700 ft., a short distance within it. The coast here turns sharply round to the eastward into Malaspina Inlet.

Hernando Island, 2 miles West of Savary, with which it is connected by the shoal previously described, and 3 miles N.N.E. of Mittenatch Island (page 479), is about 2 miles in extent, flat, thickly wooded, and from 120 to 170 ft. high. A ledge, composed of sand and huge boulders, extends two-thirds of a mile from its S.E. point. *Stag Bay*, on the North side of Hernando,

affords anchorage, and is useful as a stopping-place for vessels bound to Bute Inlet or Desolation Sound.

Baker Passage, to the northward of Hernando Island, and leading from the Strait of Georgia to the entrance of Desolation Sound, is about 3 miles long in a north-easterly direction, and 1 mile wide in the narrowest part, being bounded on the North side by Cortes and Twins Islands. The only danger is at its N.W. entrance point, off which a boulder ledge extends upwards of 3 cables in a south-easterly direction. *Centre Rock*, which covers at a quarter flood, is in the middle of the passage between Twins Islands and Cortes.

Blind Creek, on the East side of Cortes Island, $1\frac{1}{2}$ mile North of Twins Islands, is a basin of about 4 cables in extent, but useless as an anchorage.

LEWIS CHANNEL, off the entrances to Desolation Sound, between Cortes and Redonda Islands, to the westward of the latter, runs nearly straight upwards of 12 miles in a north-westerly direction, and varies in breadth from 1 mile to 3 cables, widest at the S.E. part; its shores are generally rocky, low in the South part, but rising gradually to the N.W., steep-to, and everywhere free from danger; no directions are necessary for navigating it.

Squirrel Cove, on the West side of Lewis Channel, $4\frac{1}{2}$ miles from Turn Point, the S.W. entrance point, is a small landlocked basin of 6 to 7 fathoms water, with room for a vessel of considerable size to lie at single anchor. It is entered by a narrow passage about 130 ft. wide. Squirrel Cove can only be entered by steamers or sailing vessels with a fair wind, and the chart is the best guide. There are no dangers whatever within or near it.

Northward of Squirrel Cove the West side of Lewis Channel becomes more rocky, and gradually increases in height; it takes a northerly direction for a mile to Junction Point, and then trends to the N.W. for 7 miles, the channel ending at Bullock Bluff, the North extreme of Cortes Island.

Kinghorn Island, in the South entrance to Desolation Sound, and forming the S.E. point of entrance to Lewis Channel, is about 2 miles in circumference, and from 400 to 500 ft. high; it is clifty, and steep-to on the S.W. or channel side.

DESOLATION SOUND, which may be considered as the head of the Gulf of Georgia, is occupied by a numerous archipelago of islands of various sizes. Point Sarah, on the South side of the southern entrance, is also the point where the coast turns to the eastward, and forms an arm, called by the Spanish surveyors before alluded to, and who here formed a portion of the surveying party with Vancouver, the *Bravo de Malaspina*. The latter leads in a S.E. direction, almost parallel with, and 2 or 3 miles from, the northern shore of the gulf to the distance of about 8 miles, with a smaller branch near the middle, extending about 3 miles from its northern shore to the N.N.E.

From the mouth of this inlet the continental shore continues in an easterly and N.E. direction, and for 6 miles is much indented; and several small

North Pacific.

islands and rocks lie near it to the lat. of $50^{\circ} 9' N.$, where they disappear. Between these islands and the large island on the opposite side is the entrance to *Homfray Channel*, which from hence trends in a curve to the N.N.W. for about 13 miles, being very deep, and from 1 to 2 miles in width. *Brettell Point*, on the North side of the northern end of Homfray Channel, forms the East point of the *Braso de Toba*, the entrance of which, about 2 miles wide, has two small islets in it. This arm extends in an irregular N.E. direction to the lat. of $50^{\circ} 30'$, where it terminates in shallow water and a little low land, through which flow two small rivulets. The country presents one desolate, rude, and inhospitable aspect, and was nearly destitute of inhabitants.

From the northern end of Homfray Channel, *Bryce Channel* trends to the westward, and is connected with Calm Channel, leading to Bute Inlet, by passages on either side of Raza Island.

SUTIL CHANNEL.—This extensive channel, which leads from the western part of the Strait of Georgia to the entrances of Toba and Bute Inlets, is bounded on the East side by Cortes, and on the West by Valdes and Read Islands. Its length in a northerly direction is 15 miles, and the breadth at its entrance to the Strait of Georgia 6 miles, decreasing to 1 mile in the northern part. The soundings in mid-channel are deep, though there are several dangers off both shores near the southern parts, but northward of Mary Island it is quite clear.

There are several good anchorages on either side, two of which, Drew Harbour and Carrington Bay, are easy of access to all vessels, and useful as stopping-places.

The tides in the Sutil Channel are weak, seldom exceeding 2 knots. The flood stream runs to the northward from the Strait of Georgia. It is high water, on full and change, at 6^h, and the rise and fall is 12 ft.

CORTES ISLAND.—The West side of this island, which forms the eastern boundary of Sutil Channel, is generally low, and indented by several bays and creeks, in many of which good anchorage may be found. Off *Reef Point*, its South extreme, a ledge, composed of sand and boulders, extends three-quarters of a mile, and covers at three-quarters flood.

Gorge Harbour, the entrance to which is on the West side of Cortes Island, $4\frac{1}{2}$ miles N.N.W. from Reef Point, is 2 miles long in a westerly direction, and 1 mile broad at the widest part, affording good anchorage in 9 to 12 fathoms. The entrance to it is through a narrow gorge nearly half a mile long, bounded on either side by steep cliffs about 200 ft. high, and less than 40 yards wide in some places, with 6 fathoms in the shoalest part. The tide runs through it from 3 to 4 knots. The best and most convenient anchorage is in the West part, about half a mile from the entrance.

In entering Gorge Harbour, which can only be done with a favourable tide, unless in a steamer, after passing Guide Islets, steer boldly up the gorge or entrance, and take care, on nearing its North part, to pass between Tide Islet

and the West shore, the passage East of the islet being shoal, when haul to the N.W., pass on either side of Bee Islets, and anchor in from 10 to 12 fathoms, muddy bottom, 1 or 2 cables to the westward of them.

Mary Island, on the East side of Sutil Channel, about 3 miles N.W. by W. $\frac{1}{2}$ W. from Reef Point, is of a round shape, about 6 miles in circumference, and from 70 to 150 ft. high; extending upwards of a mile in a S.S.E. direction off its South point is a ledge about 2 cables wide, called the Boulder Reef, which covers at high water. *Camp Island*, off the West extreme of Cortes Island, and 7 miles from Reef Point, is of small extent, and wooded; between it and Cortes Island is *Plunger Pass*, about 3 cables wide, deep, and clear of danger.

Carrington Bay, on the N.W. side of Cortes, about 3 miles from Centre Islet, is a mile deep in an easterly direction, about 3 cables wide, and affords anchorage at a distance of 3 cables from its head. *Von Donop Creek*, the entrance of which is $5\frac{1}{2}$ miles from Centre Islet, is long and narrow, penetrating Cortes Island in a south-easterly direction for upwards of 3 miles. There is good anchorage in 5 to 6 fathoms near its head, but the entrance being only 30 yards wide in some places, a vessel should not use it as a stopping-place.

VALDES ISLAND.—Cape Mudge, the South extreme of Valdes Island, and the S.W. entrance point of Sutil Channel, has been described in page 480. A bank extends in a south-easterly direction for some distance from the cape, and until well inside the channel the cape ought not to be approached within 2 miles. The coast of Valdes turns sharply round the cape to the N.N.W., running in a straight direction for $3\frac{1}{2}$ miles.

Drew Harbour, on the East side of Valdes, 6 miles from Cape Mudge, is about 1 mile deep, 3 to 4 cables wide, and rendered perfectly secure, and locked by a narrow strip of land called *Rebecca Spit*, which forms its eastern boundary. The anchorage, in 9 to 15 fathoms, sandy bottom, at a distance of half a mile from its head, is the best in Sutil Channel; its shores are low, and bordered by a sandy beach.

Hyacinthe Bay, on Valdes Island, and $1\frac{1}{2}$ mile N.W. of Drew Harbour, is of small extent, with from 16 to 20 fathoms water, but affords no anchorage. *Open Bay* is half a mile North of Hyacinthe Bay, and separated from it by a rocky point. A vessel should not anchor there.

Hoskyn Inlet, formed between Read and Valdes Islands, on the East side of the latter, is 7 miles long in a northerly direction, with an average breadth of two-thirds of a mile. The shores are broken and rocky, with some small islands off the South entrance and along the East side, and there is no anchorage within it, except for small craft.

READ ISLAND, bordering the West side of the N.W. part of Sutil Channel, is 9 miles long in a northerly direction, and from 1 to 3 miles broad. Its southern part is low, but rises gradually to the northward to 1,600 ft. in some places.

Viner Point, its South extreme, is bare, and about 40 ft. above high water; it lies 7 miles North of Cape Mudge.

Burdwood Bay, on the East side of Read Island, 2 miles from Viner Point, is about a mile wide, 2 to 3 cables deep, and contains several small islets. There is 12 fathoms at a short distance off shore, in its North and South parts, where a vessel may stop in fine weather, but the bay is open to the South and East.

Evans Bay, the next inlet on the East side of Read Island, to the northward of Burdwood Bay, is about 3 miles long in a northerly direction, $1\frac{1}{2}$ mile wide at the entrance, and branches off in two narrow arms near its head. Its shores are rocky and much broken, and there is no anchorage except in Bird Cove, on the West shore, where small craft may find shelter. *Frederick Point*, the N.E. point of entrance to the bay, is bold, and may be approached to 1 cable.

Hill Island, just outside the entrance of Evans Bay, is of small extent, but conspicuous from its centre, 490 ft. high. The shores are rocky, and may be approached to a quarter of a mile.

Penn Islands, near the middle of Sutil Channel, to the northward of Evans Bay, cover an extent about $1\frac{1}{2}$ mile long and 1 mile wide. They are rocky, covered with stunted trees, and their greatest elevation is about 270 ft. A vessel should not venture among them, but there is a clear passage on their East and West sides.

Directions.—Entering Sutil Channel from the Strait of Georgia, pass within half a mile on either side of Mittenatch Island, and steer N.W. by W. or N.W. $\frac{1}{2}$ W. for the entrance, taking care to keep the North side of Texhada Island open westward of Hernando and Savary Islands E. by S., until Camp Island opens West of Mary Island, N.N.W., to clear the reefs extending off the South points of Cortes and Mary Islands (p. 491); when clear of the latter danger, haul more to the northward, steering about N.N.W. or N.W. by N., and passing about a quarter of a mile westward of Centre Islet, steer up mid-channel, going, as most convenient, on either side of Penn Islands.

A vessel may beat through this channel, but till past the dangers in the South part it would not be prudent to near the West sides of Cortes and Mary Islands within $1\frac{1}{2}$ mile in standing to the eastward; and in standing towards Cape Mudge do not approach it within 2 miles, or bring Mittenatch to the eastward of E. by S. $\frac{1}{2}$ S., until the cape bears S.W., when a vessel may stand to half a mile of the Valdes shore. If intending to anchor, Drew Harbour and Carrington Bay are easy of access for any class of vessel, and but little out of the regular track.

Calm Channel, to the North of Lewis and Sutil Channels, leading from them to Butte Inlet, is 9 miles long in a N.W. by W. direction, and about 1 mile broad; its shores rise abruptly to a great height, are everywhere clear of danger, and the tides weak, except in the N.W. part. This channel is not well adapted

for any vessels except steamers, as there is generally but little wind, and no anchorage. No directions are necessary for navigating it.

Stuart Island, at the northern termination of Calm Channel, and in the entrance of Bute Inlet, is about 4 miles in extent, of an undulating surface, rising in some parts to 800 and 1,000 ft. Its shores are rocky and clear of danger.

BUTE INLET.—This extensive arm of the sea, which penetrates the continent for nearly 40 miles in a winding course to the northward, presents many similar features to Jervis Inlet, the general breadth varying from 1 to 2 miles, and the shores on either side rising abruptly and almost precipitously, in many places to stupendous mountains from 5,000 to 8,000 ft. high, whose summits are generally covered with snow all the year round. At the head are two extensive valleys, one penetrating to the N.W., and the other to the S.E., from which flow streams; the one to the westward, called by the natives *Homalko*, is navigable for a long distance by boats and stern-wheel steamers of great draught. Off these rivers some sand-banks extend a short distance, affording indifferent anchorage near their outer edges; but the soundings everywhere else in the inlet are very deep. The water for some distance from the head is nearly fresh, and of a milky white appearance. In the summer months there is a constant outset, varying in strength from 1 to 2 knots.

A direct route from the coast to the Cariboo country, by the way of Bute Inlet, was partially carried into effect in 1864, and a small wharf was erected at the mouth of the Homalko River. These solitary posts are very dangerous residences, and some frightful tragedies have occurred at them. The wholesale massacre of the white occupants has been more than once perpetrated by the bloodthirsty Indians.

Bute Inlet was proposed by A. Waddington, Esq.,* as a terminus of a railway and steamboat route between the North Atlantic and Pacific Oceans. F. Whymper, Esq., gives an interesting account of a visit to a great glacier at its head.

Arran Rapids, at the entrance of the inlet on the West side, between Stuart Island and the continent, are 1 cable wide in the narrowest part. The tides rush through with great strength, the flood from the westward; and it would be very hazardous for a vessel to go through them even at slack water.

* Mr. Waddington spent five years in procuring information respecting his proposed inter-oceanic route. His plan was to form a railroad from the head of Bute Inlet, through the Cascade Range to the junction of the Quesnelle River with the Fraser River, a distance of 222 miles. The country was quite unknown till thus explored by Mr. Waddington. From this point on the Fraser there is a direct route to the Cariboo country, and the Fraser is navigable upwards, for steam-boats for 280 miles up to the Leather or Yellow Head Pass through the Rocky Mountains; from thence the route towards Canada, by the Saskatchewan River, has been well surveyed. The details of this plan are given in the *Journal of the Royal Geographical Society*, 1868, vol. xxxviii, pp. 118—128.

Orford Bay, on the East side of the inlet, 19 miles from the entrance, is of small extent. A small vessel may use it as a stopping-place.

Waddington Harbour, at the head of the inlet, being in fact its termination, is about 2 miles in extent, and affords an indifferent anchorage off the edge of the banks extending from the Homalko and Southgate Rivers, and off its East shore. Except in the vicinity of the rivers, the land rises almost precipitously to 4,000 and 5,000 ft., is most sterile and rocky, covered with stunted pines.

Homalko or Homathko River enters Waddington Harbour on the West side, and is a stream of considerable extent, winding to the N.W. through a large valley. At the entrance is a bar with only 1 to 2 ft. over it at low tide, but within the water deepens to 1 and 3 fathoms. Homalko River and Waddington Harbour may possibly become places of some importance, as, from the sources of the former, an easy route has been discovered to the gold-mining regions in the far North of British Columbia.

In navigating Bute Inlet but few directions are required, as the points may be everywhere approached to half a cable, and, if intending to anchor in Waddington Harbour, when nearing it steer for its North part, anchoring about three-quarters of a mile off the head in 15 fathoms, and about 3 cables from the high northern shore. The anchor should be dropped immediately 15 fathoms is obtained, as the bottom shoals rapidly.

Tides.—It is high water in Calm Channel, on full and change, at 7^h, and the rise and fall is 14 ft. In Bute Inlet it is high water at 6^h, and the rise and fall varies from 12 to 14 ft.

DISCOVERY PASSAGE, formed between the West side of Valdes Island and the Vancouver shore, is the only known navigable outlet from the North part of the Strait of Georgia to the N.W., and was named after Vancouver's sloop. Its length in a N.W. and S.E. direction from Cape Mudge to Chatham Point is 23½ miles, and its average breadth a little more than 1 mile; but at Seymour Narrows it contracts to less than half a mile. Its shores, southward of the Narrows, are moderately high and apparently fertile, but northward of them steep, rugged, and mountainous.

Tides.—Southward of Seymour Narrows the stream runs with great strength, from 4 to 6 knots at springs, and turns at high and low water by the shore. At the southern entrance, near Cape Mudge and between it and Willow Point, heavy races or tide rips rage during the flood, which would be dangerous to small vessels in blowing weather. It is high water, on full and change, at 5^h 30^m, and the rise and fall is about 11 ft.

Northward of Seymour Narrows the streams are comparatively slack; they run from 1½ to 2½ hours after high and low water. At the Narrows it is high water, on full and change, at 4^h, and the rise and fall is about 13 ft.

In Discovery Passage, when to the southward of Seymour Narrows, the soundings in mid-channel vary from 30 to 60 fathoms, except at 1 mile N.W. by W. from Cape Mudge, where a shoal patch of 8 fathoms exists. In

Seymour Narrows, with the exception of Ripple Rock in its southern entrance, the least water in mid-channel is 35 fathoms, but northward of them the depth increases to 100 and 140 fathoms.

Cape Mudge, with the bank off it to the S.E., have been already described in p. 480. From it the West side of Valdes Island takes a north-westerly direction, and at the distance of 3 miles is a small indentation named *Quathiasky Cove*, bordered by a sandy beach. The cove is only fit for steamers or small craft, and only affords room for one vessel to moor in its S.E. and another in its northern part. The land between Cape Mudge and Quathiasky Cove is about 100 ft. high, flat, and fertile. An Indian village of considerable extent stands midway between the two places.

Gowlland Harbour, the next opening in Valdes Island, about 5 miles N.W. of Cape Mudge, is of considerable extent, being upwards of $2\frac{1}{2}$ miles long in a N.W. and S.E. direction, and a quarter to two-thirds of a mile broad. The best berth, if stopping for a short time, is in 6 or 7 fathoms, about 2 cables East of Vigilant Point, the N.W. extreme of Gowlland Island. In the South part of the harbour the water is deeper, and the anchorage more extended. Off the entrance is *Steep Island*, about 100 ft. high, 4 cables long, N.W. and S.E., and 1 cable wide. *Gowlland Island* protects the harbour to the S.E. *Entrance Bank* lies nearly across the entrance to the harbour, and partly dries at low water. There is a clear passage on either side of it, with not less than 4 fathoms.

From Gowlland Harbour to Seymour Narrows the coast takes a W.N.W. direction, being steep-to, high, and rugged. *Maud Island*, the S.E. point of the Narrows, is small, and about 300 ft. high.

Willow Point of Vancouver Island, the S.W. point of Discovery Passage, lies S. by W. nearly 2 miles from Cape Mudge. It is low, covered with willow bushes, and off it a sandstone ledge extends to the N.E. for nearly 3 cables. In passing the point do not approach within half a mile.

From Willow Point a low coast runs N.W. for 7 miles to *Orange Point*, and is bordered the whole distance by a sandy beach.

Duncan Bay, of which Orange Point is the East extreme, is about half a mile deep, and affords good anchorage in 14 to 7 fathoms, sand, well out of the tide, and sheltered from all except N.W. winds. This bay is easy of access, and the best anchorage southward of Seymour Narrows, and is a good place to await slack water for passing through the latter. Good anchorage will be found in 14 fathoms, with Race Point bearing N.W. by N., and the centre of Small Island, in Gowlland Harbour, N.E. by N.

Menzie's Bay, immediately S.W. of Seymour Narrows, is of considerable extent, running in a W.N.W. direction for $1\frac{1}{2}$ mile, and three-quarters of a mile broad, but in its centre is a large sand-bank, which partly dries at low water, with a narrow but clear passage on either side. Good well-sheltered anchor-

age, in 5 to 6 fathoms, may be procured between this bank and the head of the bay.

SEYMOUR NARROWS, at $10\frac{1}{2}$ miles N.W. by W. from Cape Mudge, are about $1\frac{1}{2}$ mile long, from 3 to 5 cables wide, and the shores on both sides are high, rugged, and steep-to. *Ripple Rock*, a dangerous rock, with only $2\frac{1}{2}$ fathoms least water on it, was discovered in the Narrows after the survey had been published. It is about $1\frac{1}{2}$ cable in extent N.N.W. and S.S.E., and lies almost in the centre, but rather on the western side, between Maud Island and Wilfred Point, at 3 cables S.W. by S. $\frac{1}{2}$ S. from the N.W. point of the island, nearly 2 cables from the nearest land of Wilfred Point, and near the heaviest part of the tide-race. It is therefore dangerous for large vessels during the strength of either stream, and should only be passed at or near slack water, keeping on the eastern shore. In consequence of the contraction in breadth of Discovery Passage, the tide rushes through these Narrows with great velocity, nearly 9 knots at springs; the flood and ebb streams run for nearly equal intervals of 6 hours, a very short period of slack water intervening between them.

It is recommended to choose the early part of a favourable tide to pass through these Narrows, for during the greatest strength a boiling race extends across, and steerage becomes very difficult. It is stated on good authority that a vessel steaming at the rate of 13 knots has been unable to make headway, and even to be set back, while attempting the Narrows at springs. The U.S.S. *Wachusett*, passing through the Narrows from the southward with a strong ebb, settled down in an enormous whirlpool, and struck heavily on *Ripple Rock*.

Tides.—It is high water in Seymour Narrows, on full and change, at about 3^h. The flood stream (from the northward) commences about 10^h a.m.; the velocity at springs is from 10 to 12 knots, and at neaps 6 to 8 knots. The average duration of slack water is about 10 minutes.

Northward of the Narrows, Discovery Passage takes a north-westerly direction for 12 miles to Chatham Point, the shores becoming more high and rugged than before. On the eastern shore are several bays or openings, but, with the exception of Plumper Bay, too deep to afford anchorage. The western shore is nearly straight, and near Chatham Point are Otter Cove and Elk Bay, both affording anchorage.

Plumper Bay, half a mile North of Seymour Narrows, is about two-thirds of a mile deep, and the same in width, affording anchorage in from 14 to 9 fathoms, near its S.E. part, easy of access, well sheltered, and out of the tide. *Deep-water Bay*, separated from Plumper Bay by a peninsula, is about 1 mile deep, and half a mile broad, but too deep for anchorage.

Granite Point is a high white granite bluff on the western shore, at the northern termination of Seymour Narrows. At 2 cables N.W. from Granite Point is a rock with only 9 ft. water.

Nodales Canal is an extensive opening running in a N.E. by E. direction, between Thurlow and Valdes Islands, to Cardero Channel; its western entrance, which is upward of a mile wide, with deep water, is $1\frac{1}{2}$ mile N.E. by N. from Chatham Point. There are some tide-rips off it.

Cardero Channel, passing from Buta Inlet entrance, to the northward of Valdes and Thurlow Islands, into Johnstone Strait, is very intricate, and unfit for shipping, in consequence of the irregular direction and rapidity of the tides, and the great depth of water.

LOUGHBOROUGH INLET, which runs to the northward, at the western end of Cardero Channel, is one of those extensive inlets so characteristic of this region. It extends for nearly 17 miles inland, though in many parts not more than a mile wide, between steep and nearly perpendicular mountains, from whose summits the dissolving snow descended their rugged sides in many beautiful cascades. An islet and some rocks lie off its East point of entrance; and in lat. $50^{\circ} 33'$ it appears, in ascending it, to terminate, but this arises from two interlocking points, as the inlet itself proceeds about 10 miles farther northward, terminating in the usual low land. The flood tide here varies about four hours from what occurs in the Gulf of Georgia, an evidence that it comes from the North end of Vancouver Island.

Elk Bay, on the West side of Discovery Passage, at 9 miles N.W. of Seymour Narrows, is about $1\frac{1}{2}$ mile broad, and three-quarters of a mile deep. It affords indifferent anchorage, in 14 to 15 fathoms. A rock, which covers at half flood, lies $1\frac{1}{2}$ cable off the shore, three-quarters of a mile N.W. of Elk Bay. **Otter Cove**, on the West side of Discovery Passage, and just South of Chatham Point, is a small but snug anchorage, completely sheltered from all winds by *Limestone Island*, in the centre of the entrance. If intending to anchor here, pass North of Limestone Island, and anchor midway between it and the head of the cove, in from 10 to 6 fathoms; a large vessel should moor.

CHATHAM POINT, nearly 24 miles from Cape Mudge, is the N.W. extreme of Discovery Passage, and also separates it from Johnstone Strait. It is a low rocky point, and at 2 cables N.E. from its North extreme is *Beaver Rock*, awash at low water; in rounding, the shore ought not to be approached nearer than half a mile.

Directions.—In proceeding through Discovery Passage from the southward, if the tide be favourable, a vessel has only to keep in mid-channel till past Seymour Narrows; but if the tide be unfavourable, after passing Cape Mudge, keep about 2 or 3 cables off the eastern or Valdes Island shore, which is steep-to, and the tide here does not run so strong. If unable to get through the Narrows, Menzies and Duncan Bays afford good anchorages. The latter ought to be preferred being easier of access.

North of Seymour Narrows, the tides being comparatively weak, a vessel
North Pacific.

may proceed either in mid-channel or close to either shore, except in rounding Chatham Point, which should not be approached nearer than 4 or 5 cables, to clear Beaver Rock. Plumper Bay affords a good stopping-place to a vessel unable to proceed through Seymour Narrows from the northward.

Sailing vessels of any size ought not to attempt to beat through southward of the Seymour Narrows.

JOHNSTONE STRAIT, which separates the N.E. side of Vancouver Island from the main, is comprised between Chatham Point and Beaver Cove, being about 55 miles in length in a W. by N. and E. by S. direction, with a varying breadth of 1 to 2 miles. The shore on both sides is high and rugged, more especially the southern one, which may be said to be a continuous mountain range, rising almost abruptly from the sea, the summits of which vary from 2,000 to 5,000 ft. in height, some of the higher ones being clad in snow all the year round.

The shores of the strait are nearly everywhere steep-to, except a few spots along the northern side, hereafter described. From Chatham Point to the West end of Thurlow Island the soundings in mid-channel are very deep, no bottom in many places being found with 150 fathoms. West of Hardwicke Island it again deepens to no bottom at 150 and 170 fathoms.

Tides.—Everywhere in Johnstone Strait it is high water, on full and change, at 0^h 30^m, and the rise and fall of tide is from 15 to 17 ft. The streams run from 2 to 2½ hours after high and low water by the shore, and except in the vicinity of Helmcken Island, and to the eastward of Knox Bay, they are not strong. In the former place they run from 3 to 7 knots, and in the latter 2 to 4 knots; but in other parts of the strait they seldom exceed 1 to 3 knots per hour.

THURLOW ISLAND is on the North side of Johnstone Strait, to the westward of Nodales Canal. Its South side, which borders the strait, is rocky, and about 13 miles long in a westerly direction; the eastern half is indented by several bays, off which lie some small islands.

Knox Bay, on the South side of Thurlow, and 7 miles westward of Chatham Point, is two-thirds of a mile deep, and about the same in width, affording anchorage in from 15 to 17 fathoms 2 cables from the head. The anchorage is well protected from East or westerly winds, but it ought only to be used as a stopping-place for the night or tide.

Between Knox Bay and Nodales Canal lie the *Pender Islands*, which are very rugged and barren, the largest being 150 ft. in height.

Westward of Knox Bay the coast of Thurlow Island is almost straight, running in a W.S.W. direction for nearly 6 miles, when it turns to the N.W. Its shores are high, rugged, and steep-to.

Ripple Point, on the South or Vancouver shore of the strait, 6 miles West from Chatham Point, is steep-to, and between it and Knox Bay are some heavy tide rips in blowing weather. *Camp Point*, 9½ miles W. by S. ½ S. from

Ripple Point, slopes gradually to the sea; and half a mile to the N.E. of it is *Ripple Shoal*, with from 7 to 9 fathoms.

Salmon Bay.—The coast between Ripple and Camp Points runs in a W.S.W. direction, curving slightly inwards; and westward from Camp Point to Salmon Bay it is nearly straight for $4\frac{1}{2}$ miles. Salmon Bay at high water appears of considerable extent, but affords no anchorage.

Helmcken Island, lying 3 miles westward of Thurlow Island, in the centre of the strait, is $1\frac{1}{2}$ mile long East and West, and about half a mile wide, with a clear channel of the same width on either side of it. The island is about 150 or 200 ft. high. *Speaker Rock*, which covers at one-quarter flood, lies $2\frac{1}{2}$ cables N.E. from its eastern point, and is in the track of vessels using Current Passage. *Race Passage*, to the southward of Helmcken Island, is half a mile wide, but deep and clear of danger. The tide sets very strongly through it. This is the passage generally used.

Hardwicke Island forms the North side of Johnstone Strait for 7 miles to the westward of Thurlow Island, and is separated from the latter by *Chancellor Channel*, leading to Loughborough Inlet. Near its S.W. extremity, *Earl Ledge* runs off for 3 cables, and only uncovers at low water. Two islets lie off the West point of Hardwicke, and outside them Fanny Reef, which covers or is awash at high water.

Sunderland Channel leads between the coast and the North shore of Hardwicke Island to *Jackson Bay* and *Topaze Harbour*, where anchorage will be found. The tides are here very violent and irregular, and the channel around the island contains many sunken rocks and rocky islets.

Blinkinsop Bay, on the shore of British Columbia, $2\frac{1}{2}$ miles N.W. of Hardwicke Island, and 25 miles from Chatham Point, is about $1\frac{1}{2}$ mile deep, and half a mile wide. This bay affords good anchorage, in 10 to 12 fathoms, about one-third of a mile N.E. of its S.W. point, and is well sheltered and easy of access. A 4-fathoms shoal, marked by kelp, lies 1 cable N.W. by W. from Tuna Point, the eastern point of the bay.

PORT NEVILLE, the next opening in British Columbia, West of Blinkinsop Bay, is of considerable extent, running in a north-easterly direction for 7 miles, and varying from one-quarter to 1 mile in breadth. It affords a spacious and secure anchorage, but in consequence of Channel Rock, lying near the middle of its entrance channel, great caution is required in entering. In the shoalest part of the entrance channel there is not more than $2\frac{3}{4}$ or 3 fathoms, and in the middle of its North part, $3\frac{1}{2}$ cables S.W. $\frac{1}{2}$ S. from Boulder Point, is *Channel Rock*, of small extent and very dangerous, having only 4 ft. over it.

Robbers' Nob is a remarkable low grassy point on the North side of the port, about 1 mile from Boulder Point; to the westward of it is a shoal bry, into which flow some large streams. The best anchorage is about half a mile S.W. of the Nob in 6 or 7 fathoms.

It is high water in Port Neville, on full and change, at 0^h 30^m, the rise and fall of tide being 17 feet.

The coast between Ports Neville and Harvey runs in a W. by S. direction, slightly indented. At 4 miles W. by S. $\frac{1}{2}$ S. from the entrance of Port Neville, and one-quarter of a mile off shore, lies *Simpson Reef*, which covers at half flood.

PORT HARVEY, the next inlet westward of Port Neville on the North side of Johnstone Strait, runs into the East end of Cracroft Island in a northerly direction for 4 miles, with a breadth varying from one-quarter to three-quarters of a mile, and affords good and well-sheltered anchorage in 7 to 9 fathoms, muddy bottom, at the distance of half a mile from its head. From its head to the N.W. is a narrow gorge, which partly fills at high water and joins Knight Inlet. The soundings in the entrance vary from 60 to 80 fathoms, shoaling rapidly towards the head. *Broken Islands*, off the East side of the entrance, are low, rugged, and of small extent.

It is high water in Port Harvey, on full and change, at 0^h 30^m, and the rise and fall of tide is 10 feet.

Escape Reef, lying 2 miles West of Broken Islands, and half a mile off the North shore of Johnstone Strait, is about a cable in extent, has 4 ft. least water on it, and is marked by kelp in the summer.

HAVANNAH CHANNEL, the western entrance of which is $1\frac{1}{2}$ mile North of Broken Islands, runs in a north-easterly direction from the East side of Port Harvey, connecting it with Call Creek. Its length is about 4 miles, and its breadth varies from one-half to 1 mile. There are several islands within it, which lie mostly in mid-channel. *Boughey Bay*, in the S.E. part of Havannah Channel, is about 1 mile deep in a southerly direction, and half a mile broad. A vessel may anchor in this bay at a distance of half a mile from the head. *Browning Rock*, in the North part of Havannah Channel, about one-third of a mile North of Hull Island, has only 12 ft. over it, and lies nearly in the fairway of the channel to Call Creek.

CALL CREEK, the South part of which may be said to commence at the N.E. point of Havannah Channel, is an inlet of considerable extent, its length in a north-easterly direction being 12 miles, and its breadth varying from one-half to $1\frac{1}{2}$ mile. The shores on either side are high and precipitous, rising abruptly to mountains from 1,000 to 4,700 ft. in height. The head terminates in a low swamp.

Chatham Channel, the East part of which commences at Root Point, the N.W. extreme of Havannah Channel, trends to the westward, connecting these waters with Knight Inlet. It is not recommended to use this channel. Capt. Vancouver's tender, the *Chatham*, a small brig, passed through this channel to the westward in July, 1792, and the least water found was 3 fathoms.

Forward Bay, 3 miles W.S.W. from Port Harvey, is a slight bend in the

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coast of Cracroft Island, about $1\frac{1}{2}$ mile broad, and three-quarters of a mile deep, with a small islet 30 ft. high off its S.W. point. Its shores are moderately high, and a bank extends nearly 3 cables from its head. This bay affords good anchorage, in 14 to 10 fathoms, off the edge of the bank; in entering it from the eastward guard against Escape Reef. From Forward Bay the northern shore of Johnstone Strait becomes comparatively low, and trends W. by S. for 15 miles to Weynton Passage, at the termination of the strait. *Boat Harbour*, a small cove affording shelter to boats, is 6 miles westward of Forward Bay.

Hanson and Cracroft Islands, between Boat Harbour and Weynton Passage, are low, with rocky shores, and are separated by a passage 1 mile wide. The South side of Hanson is 3 miles long, and off its S.W. point are some rocks extending for 2 or 3 cables to the westward. Off the South side of Cracroft, at the distance of 2 miles from its West point, are the *Sophia Islets*, of small extent.

For a steamer, or a sailing vessel with a fair wind, the navigation of Johnstone Strait is perfectly easy, it being only requisite to keep in mid-channel, except when nearing Helmcken Island from the eastward, when a vessel ought, after passing Thurlow Island, to keep within 3 cables of the southern shore, or Camp Point, till past Ripple Shoal, which, from being marked with kelp, is likely to have less than 7 fathoms over it. In the vicinity of Helmcken the tides are strong, but not enough to stop a steam-vessel of moderate power. To the westward of it they have no great strength.

To the northward of Hanson and Cracroft Islands are numerous islands and islets lying in the entrance of the channel leading to Knight Inlet. Between the East and North sides of Hanson Island, and the West sides of Cracroft, Harbledown, and Swanson Islands, is *Blackfish Sound*, leading to the channel northward of Malcolm Island.

KNIGHT INLET, the *Bravo de Vernacci* of Galiano and Valdes, runs a little northward of East, to the latitude of $50^{\circ} 43'$, when its width somewhat increases, and it thence takes an irregular northerly direction, to its final termination in lat. $51^{\circ} 6' N.$, long. $125^{\circ} 37' W.$ The shores of it, like all the rest, are formed by high, stupendous mountains, rising almost perpendicularly from the water's edge. The dissolving snow on their summits produced many cataracts, which fell with great impetuosity down their barren rugged sides, and gave a pale white hue to the canal, rendering its contents entirely fresh at its head, and drinkable for 20 miles below it. This dreary region was not, however, destitute of inhabitants, as a village was discovered a few miles from its upper extremity. At 10 miles westward of the point where Knight Inlet turns to the northward, the head of Call Creek approaches the southern shore to within about a mile, forming the western part into a peninsula.

At 11 miles W.S.W. from this isthmus there is a wide passage leading from the North side of Knight Inlet, with two islands lying in its entrance. The

passage winds around Gilford Island to the northward and westward for about 20 miles, having on the starboard or continental shore two smaller inlets, named by the Spanish surveyors the *Brazo de Balder* and *Baldinat*, and now named *Thompson* and *Bond Sounds*.

Deep Sea Bluff, the N.W. extreme of this passage, and so named from its appearance and situation, is in lat. $50^{\circ} 49' N.$, long. $126^{\circ} 30' W.$ The channel itself is in some parts full of innumerable rocks and rocky islets, and in it the tides are very violent. The channel to the S.W. from Deep Sea Bluff separates two of the larger islands of Broughton's Archipelago, that to the northward being called Broughton Island, and the southern Gilford Island. It is about 12 miles in length, and was named *Fife Sound*. Like all the rest, it is very deep, and the tides very irregular; on some days they were very rapid, on others scarcely perceptible.

Point Duff, the S.E. point of Fife Passage, is the West point of Eden Island; a small rocky islet lies off it, covered with shrubs. **Point Gordon**, the opposite point of entrance, bears N.W. $1\frac{1}{2}$ mile from Point Duff, and off it are several white, flat, barren rocks, lying a little distance from the shore.

The land within this western entrance is not very high, composed of rugged rocks steep to the sea, in the chasms and chinks of which a great number of stunted or dwarf pines are produced. Some few natives also visit this part.

Between Deep Sea Bluff and the East point of Broughton Island is an opening leading to a series of channels, which insulate the latter. The first, leading to the N.E., bears first to the N.E. and then to the West, forming a narrow isthmus. Vancouver found a convenient station for procuring wood and water, the only supplies this dreary region affords, near the southern part of this arm.

The shore of the main across this small opening from Deep Sea Bluff takes a W. by N. direction for about $3\frac{1}{2}$ miles; and then turns to the northward to a point where the arm takes an easterly course from an island and several rocky islets, forming passages for boats only to the eastward, while to the westward of the island, between it and **Point Philip**, is a channel of about 2 miles in width, with some islets off the latter. From this point an inlet extends 7 miles to N.E. by N., where it branches into two arms, *Wakeman Sound* to the N.W., and *Kingcombe Inlet* to the eastward. The latter extends $11\frac{1}{2}$ miles to its head, in lat. $50^{\circ} 56' N.$, long. $126^{\circ} 11' W.$, when it terminates in a similar way to the many before described. Its shores, about a mile apart, are composed of steep, high, craggy mountains, whose summits are capped with perpetual snow; the lower cliffs, though apparently destitute of soil, produce many pine trees, which seem to draw all their nourishment out of the solid rock. From its southern shore a small branch, named *Belleisle Sound*, extends about 3 miles to the S.W. by S.

Mount Stephens, conspicuous for its irregular form and its elevation above the rest of the hills in its neighbourhood, is in lat. $50^{\circ} 58' N.$, long. $126^{\circ} 40' W.$,

and is 5,665 ft. high. It will serve as an excellent guide to the entrance of the various channels with which this country abounds. It stands on the N.W. side of the inlet just described, and to the N.N.W. of Point Philip.

From Point Philip, the continental shore takes a W. $\frac{1}{2}$ S. direction for about $7\frac{1}{2}$ miles, forming an irregular channel, named *Sutlej Channel*, with the North shore of Broughton Island. At this point it becomes divided into several channels; *Mackenzie Sound*, that to the northward, takes a direction N.E. by E. for 7 miles, terminating, as usual, at the base of Mount Stephens. This narrow and intricate passage is only admissible for boats, and appears to be a chasm caused by some natural convulsion. The stupendous mountains on each side of it prevent a due circulation of the air, and exclude the rays of the sun, rendering it a most uncomfortable place.

Westward of the entrance of this passage there is an excessively dangerous channel, so caused by the innumerable rocks with which it is bestrewed, and the irregularity of the tides, which runs first to the West and then to the South. To the westward of this again, *Drury Inlet* leads for 12 miles to the W. by S.; there are many rocky islets and sunken rocks in it, rendering it dangerous even for boats. Near its termination is a very narrow opening in the northern shore, winding 5 miles towards the N.E., and named *Acteon Sound*, replete with overfalls and sunken rocks, and ending in a cascade, similar to many others hereabouts. These are perfectly salt, and seem to owe their origin to the tidal waters, which in general rise 17 ft., and, at high water, render these falls imperceptible, by the rocky bar being 4 to 6 ft. beneath the surface. Within a few yards of one of these cascades, a considerable stream of warm fresh water was discovered. Vancouver found a small Indian village on a rocky islet near this part.

From the mouth of the principal arm, and of that previously described, a channel leads S.W. into the main channel, separating Vancouver Island from the continent. It was named by Vancouver *Well's Passage*, and is about 8 miles long. The S.W. point, in lat. $50^{\circ} 49' N.$, long. $127^{\circ} 2' W.$, was named *Point Boyles*; off it lie some islets, and hence the continental shore runs to the W. by N. for 37 miles to Cape Caution, which may be taken as the limit of Queen Charlotte Sound, the N.W. entrance of the very singular and extensive inland navigation we have been describing.

At 11 miles W. by N. of Point Boyles is *Blunden Harbour*, lying within Robinson Island. Its entrance, which is $2\frac{1}{2}$ cables wide, lies between the East end of Robinson Island and *Barren Rock*, 12 ft. high, and has a depth of 6 to 9 fathoms. There is anchorage in 4 fathoms, northward of the West end of Robinson Island.

BROUGHTON STRAIT, which connects Queen Charlotte Sound with Johnstone Strait, is upwards of 14 miles in length, East and West, the breadth varying from 4 miles at the East to 1 mile at the West entrance. Its southern shore is formed by Vancouver Island, and the northern one by the South side

of Malcolm Island, and both, except near Beaver Cove, are low. There are several islands, rocks, and shoals in the eastern part; but a clear navigable passage along the southern side half a mile wide in the narrowest place, which is abreast Alert Bay in Cormorant Island.

Tide.—In Broughton Strait it is high water, on full and change, at 0^h 30^m, the rise and fall of tide being 14 or 15 ft.

Beaver Cove, at the S.E. extreme of Broughton Strait, runs in upwards of a mile in a southerly direction, and is half a mile wide; its shores are high, and the depth is too great for anchorage. Excellent marble is found here, several tons of which were quarried and taken to Victoria. *Mount Holdsworth*, a remarkable conical peak, 3,040 ft. high, and very conspicuous from the eastward, rises 3 miles to the S.W. of the cove.

Nimkish River, which flows into a shallow bay on the South shore, 5 miles westward of Beaver Cove, is upwards of a cable wide at entrance, with 2½ fathoms, but only navigable for any distance by canoes. A bank dries off for nearly a mile, leaving a narrow channel, with about 5 ft. water, into the river. On the North bank of the Nimkish, at the entrance, is a small plateau of grassy land, on which are the ruins of a large native village, called *Oheslakee*.

Port McNeill, on the South side of Broughton Strait, about 10 miles West from Beaver Cove, runs in a W.S.W. direction for 2 miles, is three-quarters of a mile broad, and affords a good, well-sheltered anchorage, in 6 to 9 fathoms. From Ledge Point, the North point of entrance, a narrow ledge with 3 to 5 fathoms on it, runs out E.N.E. 1¼ mile, and kelp grows over it in summer. *Kel Reef*, lying 9 cables S.S.W. from Ledge Point, and about 2 cables off the South shore of the port, covers at three-quarters flood. The coast from Port McNeill runs about W.S.W. 4 miles, to the entrance of Queen Charlotte Sound.

Weynton Passage.—*Pearse Islands*, in the centre of Broughton Strait, at its eastern entrance, are a group of small low islands, with some rocks extending a short distance North and S.E. of them. Weynton Passage between Hanson and Pearse Islands, is about 1½ mile wide; and unless wanting to anchor in Mitchell Bay, it ought not to be used, the tide rushing through it at from 5 to 6 knots.

Race Passage, between Pearse and Cormorant Islands, is two-thirds of a mile wide, but a rock lies in mid-channel at its South part. The passage is dangerous. *Cormorant Island* lies in the centre of the strait to the West of Pearse Islands. It is about 150 ft. high, and 2½ miles long, East and West. Gordon Point, its S.E. extreme, is 2½ miles W. by N. from Beaver Cove.

Alert Bay, on the South side of Cormorant Island, is nearly 1 mile wide, and half a mile deep, affording a good and well-sheltered anchorage in from 6 to 9 fathoms, muddy bottom. *Yellow Bluff*, the S.W. point of the bay, may be recognized by a remarkable yellow cliff at the extreme of the point. A

pier, reaching into about 12 ft. water, extends from the north-eastern shore of this bay. A supply of wood for steaming purposes can be obtained. There is a salmon cannery here.

Haddington Island, 7 miles West of Beaver Cove, in the centre of Broughton Strait, is small. Its South and West sides are steep-to, but from the northern one a bar, with as little as 9 ft. water in some parts, runs across the strait to Malcolm Island.

Between Haddington Island and the ledge running off from the North point of Port McNeill, is a passage three-quarters of a mile wide, with not less than 7 fathoms water in mid-channel.

MALCOLM ISLAND, which forms the North side of Broughton Strait, is 13½ miles long W.S.W. and E.N.E., with an average breadth of nearly 2 miles; the shores are generally low, a sandy beach extending off a short distance from them. On its South side are *Mitchell* and *Rough Bays*, in which vessels may anchor in 6 or 8 fathoms. *Donegal Head*, its East point, is high, cliffy, bordered by a beach, and the tide runs strong in its vicinity. *Dickenson Point*, on the South side of the island, is connected by a bar, with 9 ft. in some parts, to Haddington Island. Foul ground, marked by kelp, extends off its western side.

DIRECTIONS.—In navigating Broughton Strait from the eastward, when abreast Beaver Cove in mid-channel, a W. ¼ S. course, to pass not more than 2 cables South of Cormorant Island, will keep a vessel clear to the northward of Nimpkish Bank, and when the West point of Cormorant Island bears N. by E. she will be westward of it; then steer to round the S.W. point of Haddington Island within a quarter of a mile, to avoid the ledge off Ledge Point; when the North shore of Cormorant Island opens of Haddington Island E. by N., a vessel may steer out of the strait in mid channel. None, except small craft, should go to the northward of Haddington Island. Sailing vessels of any size would find it tedious to beat through this strait, and as there are several dangers it is not recommended to do so.

QUEEN CHARLOTTE SOUND is an extensive arm of the sea, connecting the inner waters North of Vancouver Island with the Pacific. It was so named by Capt. S. Wedgborough, of the *Experiment*, in 1786. Its length is upwards of 30 miles, running in an easterly direction, and its breadth varies from 10 to 20 miles, being bounded on the North by the shores of British Columbia, and on the South by the North shore of Vancouver Island. In the North and N.E. parts are innumerable rocks and islands, of which little is at present known; but along its southern sides are two broad and navigable channels to the Pacific.

Broughton Strait enters this sound at its S.E. part. From thence to Thomas Point the coast of Vancouver runs W. by N. for 9 miles, and is low; it is bordered the whole distance by a beach composed of sand and

boulders, and foul ground marked by kelp exists off it, from one quarter to half a mile.

BEAVER HARBOUR, on the South side of the sound, 9 miles westward of Broughton Strait, is 3 miles wide at the entrance and 2 miles deep. The harbour is protected or formed by several islands lying across and within the entrance; its shores are low, and from the South shore a bank extends off 3 or 4 cables. A short distance inland from its western side are seven remarkable hills, varying in height from 400 to 640 ft. There is good anchorage in the South and West parts of the harbour, but north-easterly winds send in a heavy sea, rendering it impossible to land on the South shore for days together.

Fort Rupert, a Hudson Bay Company's fort or trading post, is on the South shore; it has been established many years, and is in charge of a chief trader. Adjacent to it is a small quantity of clear land, also a very fine garden, where fruit and vegetables, common to the climate, are grown in great abundance. In the vicinity of the fort is a large native village.

Thomas Point, the S.E. extreme of the harbour, is low and rocky; some rocks lie upwards of 2 cables off it to the westward. The channel between it and Deer Island is about 4 cables wide, and clear of danger. *Moffat Rock*, 8 cables to the westward of Thomas Point, is 3 cables off shore, just at the outer edge of the bank, and uncovers at low water.

Deer Island, two-thirds of a mile North of Thomas Point, is about $1\frac{1}{2}$ mile in circumference, wooded, and about 240 ft. high; extending nearly 4 cables off its N.W. part is a reef marked by kelp, with 9 ft. water over it. *Round Island*, half a mile N. by E. of Deer Island, is small, but high, and conspicuous from the eastward. *Peel Island*, in the North part of Beaver Harbour, is three-quarters of a mile long S.W. and N.E., and between it and the West shore of the harbour is a passage 2 cables wide in the narrowest part, with 17 fathoms water. There is a good channel into the harbour, close along the East side of Peel Island, which is steep-to. *Cattle Islands*, which lie in the middle of the harbour, are small and connected with each other at low water. At $1\frac{1}{2}$ cable South of them is *Shell Islet*, the observation spot on which is in lat. $50^{\circ} 42' 36''$ N., long. $127^{\circ} 25' 7''$ W.; a reef awash at high water lies 1 cable South of it. *Cormorant Rock*, lying one-third of a mile off the western shore of the harbour, and nearly half a mile West of Shell Islet, covers at high water. A $3\frac{1}{2}$ -fathoms patch lies midway between this rock and Cattle Islands.

Dadalus Passage, leading from the West part of Beaver Harbour to the northward, is 2 cables wide in its narrowest part, and has not less than 17 fathoms in mid-channel.

Beaver Harbour is easy of access to either sailing vessels or steamers. There are three passages into it, but the ~~rather~~ one. between Thomas Point and Deer Island, is the best, and generally used, being wide enough for a

vessel to beat through. There is anchorage in 10 to 12 fathoms, about 2 cables S.E. of Shell Islet, but there is better shelter in northerly winds westward of Cattle Islands, in 6 to 9 fathoms.

It is high water in Beaver Harbour, on full and change, at 0^h 30^m, and the rise and fall is from 15 to 16 feet.

Hardy Bay, to the westward of Beaver Harbour, and separated from it by Dillon Point, runs in a southerly direction for 4 miles; its breadth at the entrance is 2 miles, narrowing to the head. There is no anchorage, except in the small creek at the head, which is difficult of access, and should not be used by a stranger. Foul ground exists between *Masterman Islet* and the N.E. point of the bay.

GOLETAS CHANNEL, which runs along the North shore of Vancouver Island to the Pacific, is 22 miles long East and West, with a breadth varying from 1 to 3½ miles. Its shores are high, rugged, and steep-to, except in the western part, and may be generally approached to a quarter of a mile. The northern side is composed of a group of islands, mostly small, through which are several navigable passages. There are four anchorages within the channel; Shushartie Bay on the South side; Port Alexander, Shadwell Passage, and Bull Harbour on the North side; and all, with the exception of the latter, are easily accessible to sailing vessels. Duval Point, on the South side at the eastern entrance of the channel, is 15 miles West of Broughton Strait.

The soundings throughout the channel to the West entrance are very deep, varying from 190 to 80 fathoms, but there the bottom suddenly rises from 40 to 7 and 9 and in one part to less than 3 fathoms, forming *Nahwitti Bar*, stretching completely across the channel, and in a great measure preventing any heavy sea rising inside it during westerly gales.

Tides.—It is high water in Goletas Channel, on full and change, at 0^h 30^m, and the rise and fall varies from 12 to 14 ft. The streams in the East part of the channel run from 1 to 3 knots, but near the West entrance, in the vicinity of Nahwitti Bar, they are much stronger, running from 2 to 5 knots, turning shortly after high and low water by the shore.

Shushartie Bay.—From Duval Point the South shore of Goletas Channel runs 15 miles in a westerly direction to Shushartie Bay, with a rugged rocky outline; it is everywhere steep-to. Shushartie Bay is about half a mile in extent, and its shores are high, except at the head, from which a sand-bank runs off more than 2 cables. There is a very limited but fairly sheltered anchorage just inside the N.E. point of the bay, in about 13 fathoms, at the distance of a cable off shore, but from the steepness of the bank it should only be considered as a stopping-place. *Dillon Rook*, which covers at one quarter flood at 1½ cable West of the East point of the bay, is in the way of vessels entering from the eastward. Southward of the bay is *Shushartie Saddle*, a double-topped mountain, 1,900 ft. high; its eastern peak bearing S. ½ E., leads West

of Dillon Rock. Anchor on the eastern shore immediately 14 fathoms is obtained.

Shingle Point, 2 miles West of Shushartie Bay, is low, and a beach runs off it a short distance. Westward of this point it is difficult to land, except in fair weather.

CAPE COMMERELL, 22 miles West of Duval Point, is the northernmost point of Vancouver Island, and the South point of the West entrance to Goletas Channel. The cape is low, and some rocks extend off it for nearly 2 cables. There is an Indian village on the East side of the cape. The large bay eastward of the cape is not fit for anchorage.

Gordon Group consists of a number of small islands running in an East and West direction for 5 miles, and bordering the North part of the East entrance of Goletas Channel. They are high and steep-to, and on the eastern or Doyle Island is *Miles Cone*, a remarkable summit 380 ft. high.

Duncan Island, 1 mile South of the Gordon Group, is about a mile in circumference, and 300 ft. high. *Christie Passage*, between the West side of the Gordon Group and Balaklava Island, is half a mile wide; its shores are free from danger. *Browning Passage*, to the West of Balaklava Island, between it and Galiano Island, runs in a north-westerly direction from the Goletas to New Channel. It is about 3 miles long, and 2 cables wide in the narrowest part; it is deep, and a mid-channel course through is free from danger. The tide is very weak in this channel.

GALIANO ISLAND, the largest of the islands on the North side of Goletas Channel, is of triangular shape, nearly 8 miles long, and $3\frac{1}{2}$ miles broad, the base fronting to the southward. The shores are very much broken along the North and East sides. *Mount Lemon*, a remarkable peak of conical shape 1,200 ft. high, rises near its S.W. part, and Port Alexander is formed at its S.E. extreme. The South side of the island is high and cliffy.

Port Alexander, upwards of 7 miles from Duval Point, and on the West side of Browning Channel, runs in a north-westerly direction for $1\frac{1}{2}$ mile, with a general breadth of about 4 cables. This port is easy of access to steamers and sailing vessels with a fair wind, and affords good anchorage in 12 to 13 fathoms, half a mile from its head, well sheltered from all except south-easterly winds.

Shadwell Passage, in the N.W. part of Goletas Channel, between Galiano and Hope Islands, is $3\frac{1}{2}$ miles long in a northerly direction, and its breadth varies from one half to $1\frac{1}{2}$ mile. The soundings in the South part of this passage are from 80 to 100 fathoms, decreasing rapidly from 9 to 13 fathoms to the northward.

Vansittart Island, in the centre of the passage at its North part, is 1 mile long. Some rocks and small islets extend 6 cables West of it. *Willes Island*, at the S.E. part of the passage, is steep-to, and may be approached to a cable.

Centre Island, in the middle of the passage, and 5 cables S.W. from Vansittart Island, is small, and vessels may anchor 2 or 3 cables N.W. of it, shel-

tered from all but northerly winds. *Suwanee Rock*, drying 4 ft. at low water spring tides, lies nearly a cable W. by S. $\frac{3}{4}$ S. from Centre Island, rendering the passage unsuitable for any but small vessels, with local knowledge. *One Tree Islet*, 4 cables West of Vansittart, with rocks and foul ground between, is small, about 40 ft. high, and has a single tree on its summit, which is very conspicuous when seen from the northward, and of great use in identifying the passage. *Cape James*, the N.W. extreme of Shadwell Passage, is a rocky bluff; some rocks extend off it to the southward for a short distance, and foul ground, marked by kelp, exists between it and Turn Point.

The South peak of Magin Saddle (on the West end of Galiano Island) in line with the East end of Centre Island, bearing S.S.E., leads through the northern entrance of Shadwell Passage, passing half a mile East of Cape James, and $1\frac{1}{2}$ cable West of Breaker Reef.

Shadwell Passage may be used by steamers or sailing vessels with a fair wind. It would hardly be prudent to beat a large vessel through it, as there is generally a heavy swell and strong tide in the North part. It is the passage usually taken by the Hudson Bay Company's vessels when bound North from the inner waters. Vessels may pass either eastward or westward of Vansittart Island, *Bate Passage*, the eastern passage, being deeper, and nearly straight.

HOPE ISLAND, the westernmost of the group which forms the North side of Goletas Channel, is 6 miles long, East and West, and its greatest breadth is $3\frac{3}{4}$ miles. The island is moderately high, and its shores are very much broken. The sea breaks heavily along its North and West sides, and off *Mexicana Point*, the western extreme, a reef extends 3 cables. The South shore is steep, and may be approached to one quarter of a mile.

Bull Harbour has its entrance on the South side of Hope Island, 2 miles from the western entrance of Goletas Channel. Though small, this harbour affords a very secure landlocked anchorage. It runs in a northerly direction for $1\frac{1}{2}$ mile across Hope Island, its head being only separated from the North shore of the island by a narrow neck of low land, 403 ft. wide; its breadth at the entrance is 5 cables, contracting to 1 cable at half the distance from the head, after which it again increases to nearly 2 cables.

Indian Island, $1\frac{1}{2}$ cable North of the narrowest part of the entrance, is small, but completely shuts in the harbour to the southward, leaving a passage 1 cable wide, on its eastern side. The anchorage is to the northward of this island, in about 4 fathoms water, but there is only room for one or two vessels of moderate size to lie moored. If intending to enter Bull Harbour, steer up mid-channel, passing East of Indian Island, and moor immediately the vessel is North of it, anchors North and South. Steamers, or only small sailing vessels, should use this anchorage, as from its narrow and tortuous entrance it is rather difficult of access to long vessels.

Nahwitti Bar, or Ledge, stretching across the West entrance of Goletas Channel, is of sandstone formation, and on the eastern edge rises suddenly from

40 to 9 fathoms, the depth increasing very gradually to the westward. Its breadth within the 10-fathoms line is from 1 to nearly 3 miles, broadest at the South part, where are several shoal spots, called *Tatnall Reefs*, with $2\frac{1}{2}$ and $3\frac{1}{2}$ fathoms, at a distance of $1\frac{1}{2}$ mile from the South shore; northward of these patches the depths vary from 6 to 9 fathoms. In heavy westerly gales the sea breaks right across Goletas Channel at this bar.

Lemon Point, Galiano Island, open North of Shingle Point, Vancouver Island, bearing E. by N., leads over Nahwitti Bar in the deepest water from 7 to 9 fathoms, well to the northward of Tatnall Reefs.

NEW CHANNEL, to the northward of Goletas Channel, and separated from it by the islands which form the North shore of the latter, is an extensive clear passage to the Pacific Ocean, about $12\frac{1}{2}$ miles long, with a breadth varying from $1\frac{1}{2}$ to 4 miles. Its depth in the shoalest part is 60 fathoms, near the eastern entrance, and its shores, except near the West part of the Gordon Group, may be approached to nearly half a mile; the North limit of the channel is formed by Walker Group to the eastward, and a few low rocks and islets to the N.W.

Generally a heavy swell sets through New Channel from the westward, and, with the exception that there is more room for a large vessel to work in or out than in Goletas Channel, there is no reason to use it in preference to the latter, unless, if running in before a heavy westerly gale, the sea were breaking across the West entrance of Goletas Channel at Nahwitti Bar. If the wind be fair a mid-channel course, about W. by N., will take a vessel clear through it.

Doyle Island, the south-easternmost of the Gordon Group, and at the S.E. point of New Channel, is three-quarters of a mile long, and, as before stated, has a remarkable summit, 380 ft. high, Miles Cone, on its centre. *Crane Islets* are small, 30 ft. high, and steep-to, there being 100 fathoms water at a cable's distance. They lie $2\frac{1}{2}$ miles westward of Doyle Island, and about 3 cables North of Gordon Group.

Boyle Island, $1\frac{1}{2}$ mile West of Crane Islets, and half a mile North of Hurst Island, is small; at half a mile N.W. of it is *Gray Rock*, which covers at one-quarter flood, and is dangerous to vessels beating through this channel. Crane Islets just touching the North side of Gordon Group, E. by S. $\frac{1}{2}$ S., leads nearly half a mile North of it.

The North shore of Balaklava Island is rugged, and half a mile N.W. from its N.W. point are three low islets, 6 ft. above high water, at the North entrance to Browning Channel.

The North shore of Galiano Island is also rugged; some outlying rocks lie a short distance of it, but it may be approached to one-third of a mile. The northern shore of Hope Island should not be approached within half a mile.

WALKER GROUP, at the N.E. part of New Channel, from 2 to 3 miles North of its South side, is composed of a number of small islands and rocks, covering an extent of 6 miles in a westerly direction, and 2 miles broad, the

highest being about 300 ft. above the sea. Among them are several small creeks and bights, which would afford shelter to boats, or even small craft. *Castle Point*, at the S.E. extreme of the group, is bold, clifly, and steep-to, with no bottom at 60 fathoms 2 cables South of it. *White Rock*, at the South extreme of the group, lies 2 miles W.S.W. from *Castle Point*, and is 4 ft. above high water. *Nye Rock*, off the South end of Schooner Passage, at the West part of the group, covers at high water; it lies W. $\frac{1}{2}$ N., $2\frac{1}{2}$ miles from *White Rock*, and may be approached to 2 cables on the South side, but large vessels should not stand inside it to the northward.

Redfern Island, the S.W. of Walker Group, is about half a mile long, and one quarter of a mile wide; half a mile S.E. of it are some rocks just above high water. *Prosser Rock*, 2 miles W. by N. $\frac{3}{4}$ N. of *Redfern Island*, is small, and about 2 ft. above high water. Nearly a mile farther in the same direction is *Bright Islet*, 100 ft. high.

Pine and Storm Islands, with their surrounding islands and reefs, occupy the middle of the western approach to Queen Charlotte Sound, and form the eastern margin of dangers between Shadwell Passage and Cape Caution. *Pine Island*, bold, rocky, and covered with trees, is about 250 ft. high, and lies $4\frac{1}{2}$ miles N.E. by N. from Cape James. It is about a mile in circumference, and *Tree Islets* lie half a mile N.E. of it. *Sunken Rock*, on which the sea breaks in bad weather, lies $1\frac{1}{2}$ mile East of *Pine Island*. *Storm Islands* are a narrow chain of islands, about 2 miles long East and West, and form a most useful landmark when crossing Queen Charlotte Sound. The western of these islands bears from *Pine Island* N.W. by N. 3 miles, and from Cape Caution S.E. by S. distant 8 miles. There are no outlying dangers beyond 3 cables. The tops of the trees are from 150 to 200 ft. high, and on the western part was a conspicuous single tree. Water can be obtained at the Indian fishing station on *Storm Islands*.

Sealed Passage, between *Pine Island* and *Storm Islands*, is about $2\frac{1}{2}$ miles wide, and *Blind Reef*, on which the sea breaks in heavy weather, extends nearly across. This passage should not be attempted. *South Rock*, awash at low water, lies $1\frac{1}{2}$ mile E. $\frac{1}{2}$ S. from *Reid Island*, the easternmost of *Storm Islands*. *Middle Rock*, covered at three-quarters flood, lies 1 mile N. by W. from *South Rock*. *North Rock*, awash at high water, lies N.E. nearly three-quarters of a mile from *Middle Rock*.

Slingsby Channel, 4 miles north-eastward of *Storm Islands*, leads to *Seymour* and *Belize Inlets*; it is 5 miles in length, with an average breadth of 3 cables, between the Outer Narrows and *Nak-wak* to *Rapids*. In the Outer Narrows, which are 1 cable in width, with no bottom at 40 fathoms, the tides run from 4 to 10 knots, strongest on the ebb, the change of tide being attended with an interval of about 15 minutes slack water. With the wind blowing in, the entrance breaks across.

Nak-wak-to Rapids (*Kah-tsis-illa*), at the eastern end of *Slingsby Channel*,

are 2 cables in width, with *Turret Island*, 80 ft. high, in the centre, against which the tide rushes with great fury. The channel westward of the islet has a 12-ft. rock in it; that to the eastward is from 6 to 11 fathoms deep. The ebb here attains a velocity of 20 knots at springs.

Steam vessels may enter the Outer Narrows in fine weather at or near slack water, and proceed to Treadwell Bay, 4 miles within the entrance on the North shore, where anchorage will be found in from 9 to 15 fathoms, avoiding the shoal of 15 ft. southward of the centre of the bay. To proceed through Nak-wak-to Rapids, which should only be done on emergency, the turn of the tide should be most carefully watched, so that the vessel may with certainty make the passage during the only 10 minutes of slack water, for at no other time would it be possible to do so with any degree of safety.

Within Slingsby Channel are *Seymour* and *Belize Inlets*, extending to the eastward, and forming between them a long peninsula, which is again indented by *Nugent Sound*, the entrance of the latter being nearly opposite Slingsby Channel. These inlets are similar to the others, narrow and deep, with lofty shores.

The Coast from Cape Commerell (page 508), the N.W. point of Vancouver Island, takes a S.W. direction for 16 miles to Cape Scott. It is rather low, but rises at a distance inland to hills 800 and 1,000 ft. high; it is indented by several bays, which, however, are too open to afford any shelter, except in southerly winds; foul ground extends off in some places more than 1 mile.

HECATE ROCK, lying W. $\frac{1}{2}$ S. $1\frac{1}{2}$ mile from Cape Commerell, and three-quarters of a mile off shore, covers at three-quarters flood, and the sea breaks heavily over it. Lemon Point, Galiano Island, just open of, or touching, Shingle Point, Vancouver Island, E. by N., leads three-quarters of a mile North of it.

At Cape Scott the flood comes from the southward, and rounding the cape sets into Goletas Channel, its strength varying from 1 to 3 knots.

SCOTT CHANNEL, between Cape Scott and Scott Islands to the westward, is $5\frac{1}{2}$ miles wide, with soundings in it varying from 25 to 40 fathoms. It is a safe navigable channel for any class of vessel, the only known dangers in it being the rocks extending nearly a mile West of Cape Scott. The tide runs through from 1 to 3 knots, the flood from the southward.

SCOTT ISLANDS extend nearly 20 miles in an East and West direction; the principal ones being five in number, with some adjacent smaller islets. There are wide passages between the western islands, but as no soundings have been obtained in them, and strong tide ripples and overfalls have invariably been observed raging there, no vessel should venture among or through them, unless compelled to do so.

Westward of Cape Scott the tides set with considerable strength to the North and South across the entrance of Goletas Channel, and a vessel passing

out northward of Scott Islands must beware that she is not set down too near them with the ebb stream.

Cox Island, the easternmost and largest of the group, and 1,047 ft. high, is about $2\frac{1}{2}$ miles in extent, with ironbound rocky shores and several off-lying dangers. This island forms the western boundary of Scott Channel, and is upwards of 5 miles W. by S. from Cape Scott.

Lanz Island, separated from Cox Island by a passage half a mile wide, is $2\frac{1}{2}$ miles long in a westerly direction, and a mile broad; its shores, like Cox Island, are rocky, and it rises near the centre to a summit 1,177 ft. above the sea. Both the islands are wooded.

East Haycock, a small islet 80 ft. high, is $2\frac{1}{2}$ miles S.W. from Lanz Island; it has a rugged outline, and some islets extend N.W. of it. *West Haycock*, 5 miles W. $\frac{1}{4}$ S. from East Haycock, is small and rocky, about 180 ft. high. Some islets extend over a mile S.W. of it, with foul ground around them.

Triangle Island, the westernmost of the group, is 26 miles W. by S. from Cape Scott: it is 680 ft. high, about a mile in extent, and differs from the other islands in being very precipitous and bare of trees, and has a remarkable gap in its summit. A ledge or reef extends 1 mile N.W. of it; to the eastward are three low islets, the outermost of which, 40 ft. high, is $1\frac{1}{2}$ mile from Triangle Island.

In navigating near Scott Islands, it is recommended to give them a good offing, especially in a sailing vessel, as the tides set very strongly through the passages between them.

This will complete the description of the circuit of Vancouver Island. Its seaward coast has been included in the previous Chapter, and this terminated at Cape Scott. Of its interior, it would be out of place to dwell upon here; but at the conclusion of this Chapter some of the more recent works on the subject are enumerated.

The COAST of British Columbia, to the northward of Queen Charlotte Sound, is less known and frequented than that adjacent to Vancouver Island. For its delineation and description we were, up to the time of the more recent British surveys, chiefly dependant on the excellent work of Vancouver. Although of old date, this was of less importance, inasmuch as from the nature of the coast, an ironbound region not liable to change its character, the careful survey, as far as it went, was a sufficient guide. As it is, it remains in almost its primeval condition. The population is chiefly Indian, and they are both intelligent and industrious, performing nearly all the labour of the salmon-canning and lumbering industries, which have gained a foothold here.

During the years 1864—1870, Staff-Commander D. Pender, R.N., assisted by several other officers, surveyed the outer coast and islands from Cape
North Pacific.

Caution to the Portland Canal, the northern limit of British Columbia on the coast. The information obtained, as published in 1883, in the Supplement to the Vancouver Island Pilot, is incorporated in the following description.

Winds.—The prevailing winds during the summer on the coast northward of Vancouver Island are from the N.W., preceded during the earlier summer months by south-westerly winds. During the winter months S.E. and S.W. winds prevail. Gales from the S.E. prevail at all seasons, and are more frequent and severe than those experienced on the coast of Vancouver Island. The nights as a rule are calm during the summer months.

The barometer stands at about 30.10 during the prevalence of N.W. winds. If during the summer the barometer fall a tenth, especially if it has been registering higher than 30.20, a S.E. gale is probable. These gales usually begin at E.S.E., veering to the southward with a falling barometer, and the wind remains at S.E. and S.S.E.; with a rising barometer the wind shifts to the S.W. with violent squalls, and then hauling more westerly blows itself out. The climate of Queen Charlotte Islands and the islands off the coast of British Columbia, is influenced by the warm body of water which washes their shores, the winter being less severe on the islands than within the inlets. Fogs are prevalent, especially during the summer months. The rainfall is great.

The Inner Channels of the seaboard of British Columbia, now to be described, afford smooth water, together with anchorages at suitable distances, for vessels of moderate length. These channels, therefore, offer facilities to steam vessels for avoiding the strong gales and thick weather so frequently met with in Hecate Strait. They are also available for fore-and-aft schooners, when navigating between Vancouver Island and Alaska. Unless directed to the contrary, the mid-channel is recommended to be kept when navigating these inner waters.

CAPE CAUTION (*Ka-Klees-la*), which forms the N.E. limit of Queen Charlotte Sound, was so named by Vancouver on his second visit, from the dangerous navigation in its vicinity. It makes a conspicuous cape, terminating in rugged, rocky, low hummocks, which produce some dwarf pine, and other small trees and shrubs, their tops being about 200 ft. above the sea. The shore is white, and of granite formation, with a few rocks off it, close outside which is deep water. The land N.E. of the cape rises gradually to *Coast Nipple*, 1,350 ft. high, 5 miles distant, 2 miles to the eastward of which lies *Mount Robinson*, 2,100 ft. high.

SEA OTTER GROUP, consisting of several dangerous rocks, islets, and shoals, which cover a space of about 12 miles in extent North and South, and 10 miles East and West, lies 6 or 7 miles from the shore, fronting the coast between Capes Caution and Calvert. Virgin and Pearl Rocks were discovered and named by Mr. Hanna, in 1786.

Danger Shoal, which is reported to break in heavy weather, is the southernmost of Sea Otter Group, and lies W. by S. $\frac{1}{2}$ S. $10\frac{1}{2}$ miles from Cape Caution ;

near the centre of this shoal there is a depth of 9 fathoms, but shallower water probably exists. The South extremes of Egg and Table Islands in line, N.E. $\frac{1}{2}$ N., leads clear to the S.E. of Danger Shoal, and all other dangers on the S.E. side of the group.

Virgin Rocks, near the western limit of the group, are three white rocks, the largest of which, 50 ft. high, lies N.W. by W. $\frac{1}{2}$ W. $7\frac{1}{2}$ miles from Danger Shoal, and West 17 miles from Cape Caution. In rounding these rocks the soundings should not be reduced to less than 30 fathoms, from 4 to 6 miles distant. *Watch Rock*, 74 ft. high and black, lies N. $\frac{3}{4}$ E. $7\frac{1}{2}$ miles from Virgin Rocks, and is steep-to. *Pearl Rocks*, the northernmost of Sea Otter Group, above and below water, extend $1\frac{1}{2}$ mile N.W. and S.E.; the largest rock, 15 feet high, lies E. by N. 3 miles from Watch Rock, and the sea always breaks on the S.E. rock. *Devil Rock*, the north-eastern danger, lies N.E. $\frac{1}{2}$ E. $1\frac{1}{2}$ mile from the largest Pearl Rock, and S.W. by S. $\frac{3}{4}$ S. nearly 3 miles from Sorrow Islands. The sea seldom breaks on it.

New Patch, on which the sea generally breaks, is nearly 2 miles in extent, and lies S. by E. $4\frac{1}{2}$ miles from the largest Pearl Rock. *Channel Reef*, the easternmost danger, has about 6 ft. over it at low water, with Table Island bearing E. by N. $\frac{1}{2}$ N. $4\frac{1}{2}$ miles, and Egg Island E. $\frac{1}{2}$ N. $3\frac{1}{2}$ miles. The sea seldom breaks on it. *Hanna Rock*, the S.E. danger, lies about $2\frac{1}{2}$ miles South of Channel Reef; it is awash at high water, and from its centre Cape Caution bears E. $\frac{1}{2}$ S. 8 miles, Egg Island N.E. by E. $5\frac{1}{2}$ miles, and Danger Shoal S.W. by S. $\frac{1}{2}$ S. $4\frac{1}{2}$ miles.

South Passage, between Cape Caution and the S.E. limit of Sea Otter Group, is here about 7 miles broad, with deep irregular soundings. False Egg Island, its own breadth open West of Egg Island, N. $\frac{1}{2}$ W., leads through nearly in mid-channel.

In the northern part of *Blunden Bay*, on the North side of Cape Caution, is *Indian Cove*, the Indian rendezvous on their canoe voyages, when passing between Queen Charlotte and Fitzhugh Sounds.

South Iron Rock, on which the sea seldom breaks, lies three-quarters of a mile to the westward of Hoop Reef, and nearly $1\frac{1}{2}$ mile N.W. $\frac{1}{2}$ W. from Neck Point, the North point of Blunden Bay. *Hoop Reef* lies about one-third of a mile from the shore. *North Iron Rock*, which dries 7 ft., lies nearly in the fairway of Alexandra Passage, N.W. by N. $\frac{3}{4}$ N., three-quarters of a mile from the South rock.

Egg Island, immediately fronting Smith Sound, 5 miles N.W. $\frac{1}{2}$ N. from Cape Caution, is the prominent landmark between Goletas Channel and Fitzhugh Sound. It is 280 ft. high, covered with trees, and is remarkable for its egg-like shape. Rocks extend about a cable from the S.W. side, and on the East side is an islet, separated from it by a narrow gully. *Egg Rocks* lie nearly three-quarters of a mile W.N.W. from North Iron Rock, and S.S.E. about 2 cables from Egg Island; they extend about $2\frac{1}{2}$ cables N.N.W. and

S.S.E., the northernmost being 30 ft. high. *Denny Rock*, a sunken danger on which the sea seldom breaks, and a source of anxiety in thick weather, lies a quarter of a mile W.S.W. from the southernmost Egg Rock.

SMITH SOUND, 6 miles N.N.W. from Cape Caution, is about 8 miles long N.E. and S.W., with an average breadth of $3\frac{1}{2}$ miles; the entrance, between Jones and Long Points, being $5\frac{1}{2}$ miles across in a N.N.W. direction. In almost every part the depths are over 40 fathoms, and there is generally a heavy swell. The S.E. shore of the sound, for 4 or 5 miles from the entrance, is fronted by several small islands and rocks. Boats will find good shelter in a small cove near Jones Point, and also in *Shelter Cove*, 1 mile to the South.

Alexandra Passage.—The entrance to the sound is protected by a plateau, on which stand Egg and Table Islands, and Cluster Reefs. The entrance of the South passage to Smith Sound is between Egg Rocks and North Iron Rock, 6 cables apart. A general leading mark through it is the West extreme of Surf Island in line with the islets near the South point of Shower Island, N.E. by N. The dangers are steep-to, and the quickest use of the lead is enjoined.

Beaver Passage, the northern channel, is entered between John Reef on the S.W., and False Egg Island on the N.E., where it is 6 cables wide. The course through is E. $\frac{1}{2}$ S., with the East extreme of Search Islands just open of the West end of Surf Islet. Good steerage and vigilant attention are required.

Table Island, the largest of the islands in the entrance to Smith Sound, is about a mile long North and South, with the tops of the trees, 120 ft. above the sea, nearly flat. A cluster of rocks, some covered at low water, extend half a mile from its West side. *Ann Island* is separated from the North end of Table Island by a narrow channel, in which boats can find shelter.

Cluster Reefs, consisting of several rocky heads and shoal patches, extend from Table Island in a northerly and north-westerly direction into the northern entrance of Smith Sound. *George Rock*, on which the sea breaks at low water, is the north-westernmost, and lies N. by W. $\frac{3}{4}$ W. 1 mile from Ann Island; *Edward Reef* dries 7 ft., and lies E.N.E. nearly three-quarters of a mile from George Rock. *Wood Rocks*, awash at low water, E. by N. nearly a quarter of a mile from Edward Reef, consist of three rocky heads, and are the north-easternmost of Cluster Reefs. The West extreme of False Egg Island in line with Kelp Head, N. $\frac{3}{4}$ W., leads to the westward; and Limit Point, midway between Long and Shower Islands, E. by N. $\frac{1}{2}$ N., leads to the northward of Cluster Reefs.

White Rocks, 35 ft. high, and very conspicuous, lie in the West entrance of Beaver Passage, at $3\frac{1}{2}$ miles N. by W. $\frac{1}{4}$ W. from Egg Island, and nearly 1 mile N.W. of Cluster Reefs. At 3 cables N.W. by N. $\frac{1}{4}$ N. from White Rocks lies *John Reef*, which dries 3 ft. at low water.

False Egg Island, resembling Egg Island in shape, but smaller, is 160 ft.

high, and lies on the North side of Beaver Passage. At about 3 cables W. $\frac{1}{4}$ N. from it lies *James Rock*, the exact position of which is somewhat doubtful; the sea breaks on it at low water, and between it and the island the bottom is foul.

Long Point, the N.W. point of Smith Sound, lies E. by N. three-quarters of a mile from False Egg Island; *Tie Islet* lies close westward of it. *Ada Rock*, awash at low water, lies S.E. by S. $\frac{1}{4}$ S. 2 cables from Tie Islet.

Browne Island, on the N.E. side of Beaver Passage, lies S.E. $\frac{1}{4}$ S. half a mile from Long Point; it is 250 ft. high, and nearly half a mile long N.N.W. and S.S.E. *Surprise Patch*, of 5 fathoms, lies N.E. by E. $\frac{1}{4}$ E. $1\frac{1}{2}$ mile from its South extreme. *Judd Rock*, with less than 6 ft. water, lies N.E. by E. $\frac{1}{4}$ E. three-quarters of a mile from Surprise Patch.

Barrier Islands, at the head of Smith Sound, consist of two large and several small islands, about 5 miles in extent N.E. and S.W. *Blakeney Passage* on the North, and *Browning Passage* on the South side of these islands, and leading to Smith Inlet, are each about 1 mile wide, and over 40 fathoms deep.

Smith Inlet (*Quas-cillah*), the continuation of Smith Sound, is said to extend nearly 25 miles in an E.N.E. direction. It has not been surveyed.

TAKUSH HARBOUR, on the South shore of Smith Sound, 6 miles within the entrance, and $1\frac{1}{2}$ mile East of Barrier Islands, is 2 miles long N.E. and S.W., and 1 mile broad. This is the only anchorage which a ship can resort to for shelter when crossing Queen Charlotte Sound. Vessels of large size can lie secure here. The entrance is three-quarters of a mile wide, decreasing to 2 $\frac{1}{4}$ cables at *Ship Passage*, which is formed by Gnarled Islands on the West, and *Fish Rocks*, drying 3 ft. at low water, on the East side. *Petrel Shoal*, with 15 ft. water, 1 cable S.E. by S. $\frac{1}{4}$ S. from the easternmost Gnarled Island, is the principal danger in rounding into *Anchor Bight*, where anchorage will be found in 10 or 11 fathoms, mud, midway between Ship Rock and Steep Point. There is an Indian village westward of Steep Point.

Fly Basin, at the head of Takush Harbour, is perfectly landlocked. The entrance is contracted to a quarter of a cable by a shoal extending from the East entrance point; between this shoal and the West entrance point there is a depth of 9 fathoms. If required, a small vessel could be taken into Fly Basin.

It is high water at Takush Harbour, on full and change, at 1^h 0^m; springs rise 14 ft., neaps 11 ft.

Directions.—Berry Point, on the South side of Fly Basin, appearing midway between the entrance points of Fly Basin, S.E., will lead through Ship Passage; and when Steep Point is well open of Gnarled Islands, bearing W.S.W., a course may be steered for the anchorage in Anchor Bight, passing midway between Anchor and Gnarled Islands, where the channel is only two-thirds of a cable wide.

Rivers Inlet entrance is about 3 miles to the northward of the North point

of Smith Inlet, and appears less dangerous than the latter. It has, however, on its southern side, many rocky islets and rocks, but none were discovered beneath the water level. By keeping on the North side of the entrance, a fair navigable passage is found, about half a mile wide, between the North shore and the rocky islets that lie off its southern side. There was no bottom found in the middle with 80 fathoms of line. From Rivers Inlet a channel diverges northward of Penrose Island towards the South end of Calvert Island. It is very narrow and intricate, leading through numerous rocks and islets to Point Addenbrooke, in Fitzhugh Sound.

At the head of Rivers Inlet is the village of *Weekeno*, and two salmon canneries and a saw-mill are established on the inlet.

CALVERT ISLAND forms part of the exterior coast northward of Rivers Inlet, and within it is Fitzhugh Sound; the former was discovered and named by Mr. Duncann, the latter by Mr. Hanna. The eastern side of the island forms a steep bold shore, rising abruptly from the sea to a great height.

FITZHUGH SOUND, the entrance to which lies 5 miles northward of Smith Sound, is 39 miles long in a general N.N.W. and S.S.E. direction, having an average breadth of 3 miles, with no known hidden dangers throughout. The southern entrance lies between Cranstown Point and Cape Calvert, 5 miles W. $\frac{1}{2}$ N. from it.

The coast from Long Point extends N.W. by N. $2\frac{1}{2}$ miles to *Kelp Point*, from which *Cranstown Point* bears N. by W., distant 1 mile. *Canoe, Spur*, and *Paddle Rocks*, lie about a mile off Kelp Point, occupying a space of $1\frac{1}{2}$ mile N.N.W. and S.S.E., and more or less covered with growing kelp. *Canoe Rock*, the centre and most prominent of these rocks, is bare, 25 ft. high, and stands boldly out from the coast. *Open Bay*, on the N.E. side of Cranstown Point, affords anchorage in 7 fathoms, but it is only used by local craft as a temporary anchorage.

Cape Calvert is the South extreme of Calvert Island, and at 2 miles North of it lies *Entry Cone*, 1,200 ft. high, which forms a good mark from the southward and westward. The cape is fronted by the *Sorrow Islands*, which are steep-to, and covered with trees; between them and the cape fair shelter may be found for boats in *Grief Bay* (Telakwas).

Directions.—In entering the sound from the southward, Addenbrooke Island open, and the East shore of the sound (beyond) shut in by Cape Calvert, bearing N.W. by N. $\frac{1}{2}$ N., will lead midway between Channel Reef and Egg Island, and up to the entrance of Fitzhugh Sound. Allowance should be made for tidal streams; the flood sets to the eastward into Queen Charlotte and Smith Sounds with a velocity at springs of nearly 2 knots. Vessels from the westward should use North Passage, between Sea Otter Group and Calvert Island; this passage is about 3 miles wide, but *Hedley Patch*, of 9 fathoms (probably less), lies in the West entrance, at $3\frac{1}{2}$ miles N. $\frac{1}{2}$ W. from Watch Rock (page 515).

Schooner Retreat (*Ka-pi-lish*) is the name given to the anchorages among a cluster of islands at the S.W. end of *Penrose Island*, which here separates Fitzhugh Sound from Rivers Inlet. It affords a secure stopping place, and with care may be safely entered by steam vessels. During S.E. and S.W. gales the gusts are furious, but with good ground tackle and care there need be no danger in Schooner Retreat.

Safe Entrance, between Joachim and Ironside Islands, the largest of the group, is three-quarters of a mile wide, and has from 8 to 17 fathoms water in the middle. On its West side lie *Grey Islands*, with a 2 to 3-fathoms shoal extending $1\frac{1}{2}$ cable northward of them. *Comber Rock* covers at three-quarters flood, and lies S. by W. three-quarters of a cable from *Surf Point*, the S.W. extreme of Ironside Island.

Frigate Bay, the southern anchorage in Schooner Retreat, is about half a mile long N.E. and S.W., and a quarter of a mile broad, with depths of 9 to 20 fathoms. The best anchorage will be found just within *Safe Entrance*, off a clean sandy beach, in 13 fathoms water, with the N.E. extreme of Ironside Island bearing W. $\frac{1}{2}$ S., and the N.W. extreme of Sea Bluff, on the East side of the entrance, S. $\frac{1}{4}$ W. It is necessary to moor. *Maze Islands* are a cluster of small islands on an extensive shoal projecting from the N.E. end of Ironside Island, and leaving at its N.E. end a narrow channel with $5\frac{1}{2}$ to 9 fathoms water, which leads from Frigate Bay to Secure Anchorage.

Secure Anchorage is about a quarter of a mile long N.E. and S.W., and $1\frac{1}{2}$ cable broad, with depths of 9 to 11 fathoms. *Verney Passage*, leading to it from the westward, between Ironside and Bird Islands, is contracted to about 30 yards in width by the shoals on either side, and is only suitable for small coasting vessels.

It is high water in Schooner Retreat, on full and change, at 0^{*h*} 30^{*m*}; springs rise 14 ft., neaps 11 ft.

Directions.—Vessels bound to Schooner Retreat should at all times use *Safe Entrance*. If from the southward, Quoin Hill, 880 ft. high, at the West part of Penrose Island, should be brought in line with the hill, 200 ft. high, on the East end of Ironside Island, bearing N.N.E., which will lead to abreast Karlake Point, the West extreme of Joachim Island, when *Safe Entrance* will be open. After passing Karlake Point, steer very carefully towards Bluff Point until Quoin Hill is in line with Centre Island bearing N. $\frac{3}{4}$ E., which will lead through in mid-channel, and to the anchorage in Frigate Bay.

Safety Cove (*Oat-so-ulis*) (*Port Safety* of Mr. Duncan?) is 7 miles northward of Cape Calvert, on the West shore of Fitzhugh Sound. It terminates in a small beach, near which is a stream of excellent water, difficult for boats to reach. It is the first place that affords safe and convenient anchorage on the western shore within Fitzhugh Sound. Vancouver found it a comfortable retreat, in August, 1792.

Safety Cove is about a mile long W.S.W. and E.N.E., and nearly half a mile

wide at its entrance, to the westward of which the shores of the cove extend parallel to each other at a distance of 2 cables apart; the head is filled by a shoal extending out 3 cables. The North entrance point has two small islets lying off it, which are useful in identifying the entrance.

There is good anchorage in 13 fathoms, mud, in the middle of the cove, abreast a waterfall on the North shore. It is high water, on full and change, at 1^h 0^m; springs rise 14 ft., neaps 11 ft.

At 4 miles North of Safety Cove Fitz-hugh Sound is contracted to 1½ mile by *Addenbrooke* and adjacent islands, which lie on the East side. *Kwakshua Passage*, 7½ miles North of Safety Cove, leads to the sea, between Calvert and Hecate Islands; it has been used by coasting vessels. *Hakai Channel*, 5½ miles North of Kwakshua, and *Nalau Passage*, 4 miles farther on, are two other unexplored channels leading to sea. (See pp. 524-5.)

Goldstream Harbour, at the North end of Hecate Island, affords good accommodation for small vessels; it is about 2 cables in extent, with depths of 7 to 15 fathoms, sand and mud. The entrance is through an intricate passage little over half a cable wide, between the shore and an island which forms the North side of the harbour. *Evening Rock*, drying 3 ft. at low water springs, lies near the middle of the passage, about 2 cables within the entrance; it would, therefore, be advisable to place a boat near this rock before entering or leaving the harbour. It is high water, on full and change, at 1^h 0^m; springs rise 15 ft., neaps 12 feet.

BURKE CHANNEL.—Fitzhugh Sound extends 24 miles from Safety Cove in nearly a true North direction to *Point Walker*, where it separates into two arms, the northern one named *Fisher Channel*. The easternmost was named by Vancouver after Edmund Burke. Its S.E. point is *Point Edmund*, about 2 miles S.E. by E. from Point Walker. There are some islets off Point Edmund, but the channel is fair. The sides of the canal are composed of compact, stupendous mountains, and nearly perpendicular rocky cliffs, producing pine trees. From its entrance it trends 55 miles to the north-eastward to *Bela-kula*, at the head of North Bentinck Arm. Though not surveyed in detail, it has frequently been traversed, and may be safely navigated by the Admiralty chart.

Namu Harbour, 1 mile S.S.E. of Edmund Point, is three-quarters of a mile long, E.N.E. and W.S.W., and the same in breadth, with depths of 20 to 28 fathoms; in the entrance lies *Kiwash Island*, 200 ft. high, small, and covered with trees, with a deep channel on either side of it, the southern one nearly half a mile wide, and the northern 3 cables wide.

Large vessels should anchor in 20 fathoms, in the centre of Namu Harbour, with the North extreme of *Kiwash Island* bearing West, and the West extreme of *Plover Island*, the South point of the harbour. S. by E. Small vessels may anchor in *Whirlwind Bay*, on the East side of the harbour, in

12 fathoms, but during autumn and winter it is not recommended, as the williwaws blow with furious strength over the mountains, 3,000 ft. high.

Restoration Cove is about 12 miles within the entrance of Burke Channel, and has a fine sandy beach. The breadth of the cove at its entrance, in a North and South direction, is about $1\frac{1}{2}$ mile, and its depth about three-quarters of a mile. The soundings, though deep, are regular, from 60 fathoms at the entrance, to 5 and 10 fathoms close to the shore. The land on the opposite or western side of the arm is about 2 miles distant. The tide rises and falls 14 ft. A vessel may anchor in 20 fathoms, 2 cables off the beach.

From hence Burke Channel extends to the N.E., its N.W. side being formed by a large island, named by Vancouver *King Island*. After continuing 7 miles in an easterly direction from the N.E. point of King Island, the canal separates into two arms, to the N.E. and S.E., at *Point Menzies*. These arms were named by Vancouver *Bentinck Arms*. The width of that to the S.E. in general a little exceeds a mile, and the country exactly resembles that contiguous to the branches, which have been so repeatedly described. The mountains around the head of the North Arm rise to over 5,000 ft. in height.

Sir Alexander Mackenzie reached the Pacific after his long, arduous, and perilous journey across the continent at this point, a month after Vancouver's party had left. He came to a village of twenty-six large houses, where Mr. Johnstone had come on June 1st, 1793. He coasted along King Island, and learned that Macubah (as the natives termed Vancouver) had been there with his large canoe. He commenced his return July 22, 1793.

This is as desolate, inhospitable a country as the most melancholy creature could be desirous of inhabiting.

Belakula.—*New Aberdeen*, a recent establishment, is at the head of the N.E. Bentinck Arm, and is the site of a post of the Hudson's Bay Company. The old charts place "the village of Rascals" here—an expressive name. It was afterwards called *Kougotes*, *Belhoula*, or *Belakula*. The Belhoula, or Bella Coola River, flows into the head of the arm in a W.S.W. direction, the land near its mouth being partially cultivated by the Indians. Much attention has been directed to this place, as a point of departure for the upper course of the Fraser River, and a "trail" exists to Fort Alexandria below the mouth of the Quesnelle.* Capt. Mayne gives an account of several expeditions which have crossed the intermediate country (pages 145—151).

At Belakula vessels anchor close to the mud flat at the mouth of the river, on the South side. In taking up a berth great care is required, to guard against getting too near the edge of the flat, which is quite steep-to. A large

* A terrible tragedy occurred on this road in May, 1864. The treacherous Indians destroyed nearly the whole of a party who were making their way to the Cariboo Gold Fields. The particulars are quoted in Mr. F. Whympers interesting work, pp. 34, 35.

vessel should moor in 45 to 50 fathoms. Small vessels may find shelter during summer, on the North shore, under *Custom House Point*.

The N.E. point of King Island was named *Point Edward*, and around it *Labouchere Channel* leads from Burke Channel to *Dean Canal*, which penetrates many miles in a N.E. and North direction, terminating in low marshy land.

Cascade Canal is to the N.W. of Point Edward. Its shores are bounded by precipices more lofty than any hereabouts; and from the summits of the mountains, particularly on the N.E. shore, are some extremely grand and tremendous cascades. The southern part of Dean Channel, forming the N.W. side of King Island, runs S.W. to Fisher Channel, which separates the southernmost of the *Princess Royal Islands* from the main land.

PRINCESS ROYAL ISLANDS form a portion of that immense archipelago which here fronts the American continent. On its western side it is uneven, rocky, and of moderate height. The eastern shore rises more abruptly, and is bounded behind with lofty snowy mountains.

Fisher Channel.—*Fog Rocks*, rather on the East side of Fisher Channel and 3 miles North of Walker Point, consist of six rocks above water, the highest 25 ft. high, with a few shrubs on it; they may be passed on either side.

Port John.—At 8 miles northward of Fog Rocks is an indentation in King Island, with Port John in its northern part, immediately under Remarkable Cone, 2,300 ft. high, and terminating in *Evans Arm* to the southward. Port John, so named by Vancouver, affords anchorage in 20 fathoms, but is much confined by *Mark Rock* nearly in the middle, and by the flat extending off the stream at the head. There is also anchorage at the head of Evans Arm in 20 fathoms, which may be reached through the passage South of Boot Island. There is a salmon-fishery on the South side of Evans Arm.

To the North of Port John is the entrance to Dean Canal, previously mentioned, which passes round the N.W. side of King Island toward Cascade Canal. Fisher Canal continues its northern course for 4 miles above Port John, its shores being comparatively of moderate height. At this point it joins *Johnson Channel* which leads to *Bullock Channel*, the latter taking a south-westerly course to Milbank Sound, and thus forming the North limit of the southern Princess Royal Islands. The shores of Johnson Channel are stated to be low and rocky, with many detached rocks lying off them. The southern part of Bullock Channel is stated to have many rocks and breakers in it, but all sufficiently conspicuous to be avoided in fair weather. Several inlets or arms run up to the northward from the canal leading from Fisher Canal into Milbank Sound. They are very similar in character and need no particular description.

LAMA PASSAGE is the main passage connecting Fisher Channel with Seaforth Channel and Milbank Sound; its eastern entrance, 6 miles North of Fog Rocks, may be recognised by a conical mountain 1,000 ft. high, on the

N.E. point of Hunter Island, and by Pointer Island, on the South side, where it is nearly a mile wide. Thence the passage trends West 2 miles to abreast Serpent Point on the South shore, the breadth being about half a mile; it then widens and trends W.S.W. 4 miles to abreast Twilight Point, the S.W. point of Denny Island.

Camp Point, at the S.W. extremity of Denny Island, should not be rounded nearer than half a mile, as the bottom is foul for a distance of 3 cables. The North entrance to Plumper Channel, which is a mile wide, lies opposite Twilight Point, from which Lama Passage turns to the north-west for 4 miles to Grave Point, southward of which the passage is contracted to 2 cables. *Bella Bella Islands*, three-quarters of a mile North of Grave Point, are bare and about 15 ft. high.

Cooper Inlet, on the South shore of Lama Passage, 5 miles from the eastern entrance, is deep and contains several small creeks and rocks; but in fine weather anchorage may be obtained in 14 fathoms water under Westminster Point, its N.W. point, by bringing it to bear W.N.W. *Jane Creek*, in the S.E. corner of Cooper Inlet, may be used by small vessels. Large vessels may anchor in about 18 fathoms in the entrance, midway between Charles and George Points. Reefs extend a cable north-westward of Charles Point, the northern point.

McLaughlin Bay, on the West shore of Lama Passage, half a mile South of Grave Point, is a good stopping-place; it is about 4 cables wide and $1\frac{1}{2}$ cable deep, with 8 to 14 fathoms water. The anchorage is in 11 fathoms off the centre of the beach about a cable from the shore. In this bay is the site of an old Hudson Bay trading post, founded in 1837, which in 1868 was again used as such. This is the only Indian winter residence between Queen Charlotte Sound and Seaforth Channel. There are stated to be three villages here, with a population of about 500.

The Indians state that a rock exists in Lama Passage, abreast McLaughlin Bay, lying half a cable from the eastern shore.

Klick-tso-atli Harbour, on the North side of Denny Island, and $1\frac{1}{2}$ mile East of Bella Bella Islands, is about a mile in extent, and affords excellent shelter for vessels of any size. *Steamer Passage*, the channel West of Harbour Island, off the N.W. point of the harbour, is 1 cable wide, and suitable for small vessels; large vessels are recommended to pass through *Wheelock Pass*, between a 3-fathoms patch near the centre of the channel and the 3-fathoms shoal extending three-quarters of a cable off *Noble Point*, the N.E. entrance point of the harbour. The West extreme of Cypress Island in line with the East extreme of Meadow Island, N.W. by N. $\frac{1}{4}$ N., leads through Wheelock Pass in 11 to 19 fathoms water, and when Harbour Island bears West a vessel may anchor in 12 fathoms. Secure anchorage may also be obtained in 15 fathoms, with Harbour Island bearing S.E. by S. $\frac{1}{2}$ S., distant 3 cables.

Main Passage, leading from Lama Passage to Seaforth Channel, between the N.E. extreme of Campbell Island and Narrow Island, is three-quarters of a mile long N.N.E. and S.S.W., and from 2 to 2½ cables wide. *Narrow Island*, about three-quarters of a mile North of Bella Bella Islands, is three-quarters of a mile long E.N.E. and W.S.W., with a ledge of rocks, awash at high water, at a cable from its South side. Some islets and a reef lie between it and Deer Island, to the eastward.

Gunboat Passage, between Denny and Cunningham Islands, is narrow and intricate, containing many rocks and kelp patches. From its western entrance it trends about E. by N. 6 miles, thence North 2 miles to its eastern entrance, at the junction of Fisher and Dean Channels. This passage should not be attempted unless in small handy steam-vessels, with good local knowledge.

Outer Coast.—We now proceed to describe the outer coasts of the islands which form Fitzhugh Sound and the inner channels to the northward, commencing at Cape Calvert (p. 518).

CALVERT ISLAND is but little broken on its southern and western shores, which are comparatively low, and thickly wooded. *Sorrow Island*, at the pitch of Cape Calvert, is conspicuous, and an excellent thick-weather mark, from its clifly formation, and by being covered with stunted trees. Landing, in fine weather and off-shore winds, may be effected in Grief Bay (p. 518), and in other bights westward to Herbert Point, the S.W. extreme of the island, about 8 miles distant.

Mark Nipple, an isolated hill, 350 ft. high, a mile E.S.E. of Herbert Point, is a very useful landmark. *Blakeney Islet* lies half a mile off the S.W. extreme of Calvert Island, and at 1½ mile W. by N. of it is the western edge of *FitzRoy Reef*, the most outlying danger off the western shore of Calvert Island; it uncovers at low water, and extends about 5 cables East and West. *Carrington Reefs*, a cluster of sunken rocks, extend 5 cables from the shore at 1½ mile northward of Blakeney Island. The coast northward of Carrington Reefs is foul to the distance of 5 cables.

Kwakshua Channel, unexamined, lies between Calvert and Hecate Islands. At its western entrance it is 5 cables wide, but *Kwakshua Rock* lies nearly in mid-channel, and over it the sea only breaks at intervals.

Hecate Island forms the southern shore of Hakai Channel; reefs extend 8 cables off its West side. Near the S.W. end is *Leading Peak*, a sharp summit, 1½ mile northward of which is *Sugar-loaf Hill*, 500 ft. high.

HAKAI CHANNEL, between Hecate and Nalau Islands, is about 7 miles long in a general N.E. ½ N. and S.W. ½ S. direction, and from 1 to 1½ mile wide. Numerous islets and rocks lie on each side of the entrance.

This channel is not recommended to a stranger. If using it, steer midway between North and South Pointers Rocks; thence a mid-channel course, N.E. ½ N., towards a conspicuous mountain on the eastern shore of Fitzhugh

Sound, will lead through into that sound. The tidal streams attain the velocity of 4 knots an hour at springs.

South Pointers, a small cluster of black rocks, 2 ft. above high water, and surrounded by sunken dangers to the distance of 2 cables, lie on the South side, $1\frac{1}{2}$ mile westward of the Starfish Group. *Starfish Islands*, wooded, and from 70 to 150 ft. high, lie on the South shore, and extend about $1\frac{1}{2}$ mile N.E. and S.W. The group consists of three principal islands, much broken into long, rocky, narrow creeks, with shores of white cliffs. *Choked Passage*, southward of the Starfish Group, is obstructed by rocks awash, reefs, and sand-banks. *Starfish Ledge*, over which the sea usually breaks, lies 2 cables from the N.W. shore of Long Island, the northernmost Starfish Island.

North Pointers are a cluster of bare rocks, of light colour, lying on the North side of the entrance; the outer rock lies N.N.W. $2\frac{1}{2}$ miles from South Pointer Rocks. *Breaker Group*, also on the North side, is about a mile in extent, the larger islands being wooded, and about 250 ft. high. *Breaker Ledge* uncovers at half ebb, and lies 5 cables S.E. of the centre island.

East Rock, on the South shore, off the mouth of Welcome Harbour, is awash at low water, and lies half a mile off shore, and 5 cables N. by E. from Kelp Point, the western entrance point of that harbour. *Port Reef*, awash at high water, lies E. $\frac{1}{2}$ S. 2 cables from East Rock. Leading Peak, at the head of Welcome Harbour, seen in line with Bluff Point, on the North side of the harbour, bearing S.S.E., will lead westward, and South Pointers Rocks S.S.W. will lead northward of these rocks.

Welcome Harbour, on the South shore of Hakai Channel, is 3 cables wide at its entrance, and extends $1\frac{1}{2}$ mile to S.S.E., affording good shelter to small vessels. On its North shore is a sandy beach, where a vessel might be beached.

Fairway Rock, with 24 ft. over it, lies nearly in mid-channel at the mouth of Welcome Harbour. Leading Peak seen just northward of Bluff Point, bearing S.S.E., will lead eastward of it. *Harbour Ledge*, 1 cable from the N.W. shore of Harbour Island, is small and dries 4 ft. *Codfish Rock*, with 12 ft. over it, lies half a cable off the South shore of Harbour Island. *Wolf Rock*, awash at high water, lies close to the East shore, at 2 cables northward of *Sandspit Point*, which has a sandspit extending 1 cable off it.

To enter the harbour, having passed not less than 5 cables northward of Starfish Group, the leading mark for clearing East Rock should be brought on and steered for. Especial care will be necessary if the flood stream be making. Having cleared East Rock, pass East or West of Fairway Rock, and anchor in 7 to 9 fathoms off Sandspit Point, midway between Leading Island and Wolf Rock, with the former bearing N.W. distant 1 cable.

Exposed Bay, on the South shore of Hakai Channel, abreast Breaker Group, has a dangerous cluster of sunken rocks near its centre.

Nalau Passage, between the Nalau Group and Hunter Island is useless for navigation. On the North side of its entrance is *White Cliff Island*, 4 miles

W. by N. $\frac{1}{2}$ N. from the outer North Pointer Rock; it is of small extent, bare, and 250 ft. in height, its shores consisting of high white cliffs.

QUEEN SOUND, between Goose Islands and *Hunter Island*, is about 12 miles long N. by E. and S. by W., and from 4 to 8 miles wide. At its northern end is a labyrinth of islands and islets, rendering it intricate and dangerous. *Spider Island*, 250 ft. high, at 3 miles northward of White Cliff Island, is $3\frac{1}{2}$ miles long N.N.W. and S.S.E., and $1\frac{1}{2}$ mile broad, and connected with Hunter Island by a ledge of rocks awash; its N.W. extreme terminates in high, bold, white cliffs. At $2\frac{1}{2}$ miles northward of Spider Island is *Superstition Point*, off which a ledge of high rocks and sunken dangers extends $1\frac{1}{2}$ mile to the S.W. Near it are strong tide races.

Purple Bluff, 5 miles N.W. of Spider Island, is the S.W. extreme of a group of islands, islets, and rocks, at the mouth of Plumper Channel, and terminates in high, bold, basaltic cliffs, of a purple tint. The group extends over a space of nearly 5 miles.

Goose Islands, 5 miles westward of Spider Island, consist of four principal islands, connected at low water; the largest and northernmost is 250 ft. high, wooded, and its N.E. extreme terminates in conspicuous high white cliffs. On the eastern side of the West island is *Yellochi*, an Indian fishing village. *Gosling Rocks*, awash and sunken, extend nearly 4 miles S.S.E. of the South island. *West Rock*, awash, lies 1 mile S.W. of the western island. *Peveril Rock*, awash, lies $1\frac{1}{2}$ mile N.N.E. from the northern island.

Plumper Channel leads between Hunter and Campbell Islands, from Queen Sound into Lama Passage. Its southern end is obstructed by numerous islets and rocks. *Hecate Channel* leads between Campbell Island and the Bardswell Group from Queen Sound into Seaforth Channel. This channel is also obstructed at its southern end by numerous islets and rocks.

Broken Group (*Qual-a-gute*), 2 miles northward of Goose Islands, extends 2 miles N.N.W. and S.S.E., and consists of several islets and rocks, connected by ledges. *Fingal Island*, small and wooded, lies 1 mile W. by N. from the northern island, and ledges extend 1 mile southward of it. *Middle Rock*, 6 ft. high, lies $2\frac{1}{2}$ miles W. by S. from the South island. *North Breaker*, a dangerous sunken rock, lies N.N.W. 1 mile from Middle Rock. *Limit Island*, small and wooded, with foul ground extending 5 cables S.W. of it, lies 2 miles N.W. $\frac{1}{2}$ W. of Fingal Island, and about a mile off Bardswell Islands. At a mile westward of Limit Island are *Rempstone Rocks*, awash at high water, 1 mile apart E. by S. and W. by N. The western rock lies $1\frac{1}{2}$ mile S.E. of Cape Swain.

Bardswell Islands lie on the eastern side of Milbank Sound, and are low and wooded, extending over a space 7 miles square, with several boat channels among them.

MILBANK SOUND, discovered and named by Mr. Duncan, is an opening between the Princess Royal Islands, in lat. $52^{\circ} 13'$. Its S.E. point is *Cape*

Swain, so named after the third lieutenant of the *Discovery*, Vancouver's vessel; the cape is low and wooded. Its N.W. point is *Point Day*, 9 miles N.W. by W. $\frac{1}{2}$ W. from Cape Swain, and a group of wooded islets, with numerous rocks, extend 2 miles S.S.W. from it. The southern and eastern sides of the sound, being entirely covered with trees and with low shores, is very pleasant in appearance, but the northern sides are a rude, confused mass of low, rugged cliffs, bounded by innumerable rocky islets and rocks. Behind Jorkins Point, at the head, the land of Princess Royal Island rises in mountains 1,500 to 2,000 ft. high. The sound extends 17 miles in a northerly direction to Jorkins Point, at the entrance of Finlayson Channel, with very deep water.

Price Island, forming the western shore of Milbank Sound, has a conspicuous ridge of hills along its eastern shore. From Day Point its eastern shore trends N. by E. for 4 miles to *Aldrich Point*, half a mile northward of which is *Boat Cove*, affording shelter to boats. The coast North of Boat Cove is almost straight and unbroken for 7 miles to N.W. by N. $\frac{1}{2}$ N. to the entrance of *Schooner Passage*, a narrow intricate channel to Laredo Sound.

Directions.—Approaching Milbank Sound from the S.W., *Helmet Peak* on Lake Island, 1,032 ft. high, is conspicuous. *Stripe Mountain*, on the North side of Dowager Island, is 2,020 ft. high, with a remarkable landslip down its S.W. side. *Helmet Peak* in line with White Rock, N.E. by N. $\frac{1}{2}$ N., will lead up nearly in mid-channel. When within 2 $\frac{1}{2}$ miles of White Rock, steer E. by N. $\frac{3}{4}$ N. towards Seaforth Channel, or N. by W. towards Finlayson Channel.

A channel 8 miles broad, with depths of over 100 fathoms, mud, extends south-westward of Milbank Sound. North-westward of this channel the depths decrease to 50 fathoms, and less, at the mouth of Laredo Sound, with a bottom of fine sand. South-eastward the depths are 76 and 80 fathoms, over sand, mud, and rock at intervals. In thick weather, therefore, when approaching the sound from the south-westward, with average precautions, a vessel's position should be indicated by the deep-sea lead.

Tides.—The flood stream approaches from the southward, and divides near the middle of the sound; one portion running towards Finlayson Channel, another towards Mathieson Channel, and another towards Seaforth Channel. The reverse takes place on the ebb. The rate is variable, but it seldom exceeds 1 knot an hour in Milbank Sound; increased, however, within the channels to 2 and 3 knots an hour.

Off Cape Swain are the two dangerous *Discovery Rocks*, 8 cables apart N. by E. and S. by W. The sea seldom breaks over the southern one, which lies a mile W. $\frac{3}{4}$ S. from the cape. About 5 miles within the entrance lie *White Rocks* (Ka-mas-ik), half a mile apart N. by E. and S. by W.; the northern one is 6 ft. high, and the southern one 50 ft. high. At 2 $\frac{1}{2}$ cables E. $\frac{1}{2}$ N. of

the latter is *Sound Rock*, with 12 ft. water on it, and another rock lies half a mile to the S.W.

St. John Harbour (*Cheek-Squintz*) lies on the S.E. shore of Milbank Sound, nearly midway between Cape Swain and Sound Point. Though confined, and with a narrow entrance, it affords good anchorage for small vessels. It is protected at its entrance by *Rage Reef* of rocks awash, and *sunken rocks*, which form a natural breakwater, and eastward of this reef there is a clear channel, 2 cables wide, with depths of 10 to 30 fathoms; ledges extend a cable from the eastern shore. At 5 cables within the entrance lie two small islands, *Wood Island*, the eastern and smaller one, being round, wooded, and conspicuous. The channel eastward of these islands is barely a cable wide, and leads into *Anchor Bay*, which is the usual anchorage for small vessels. Westward of the islands the channel is wider and leads into *Deep Bay*.

In approaching St. John Harbour from the northward, Cape Swain should be kept well open of the conspicuous quoin-shaped point 2 miles northward of the cape, bearing S. $\frac{1}{2}$ W., until Wood Island is distinctly seen, and North point bears East. Bring Wood Island to bear S.E. by S. $\frac{3}{4}$ S., and steer for it, passing half a cable eastward of it, and anchor in 10 to 11 fathoms, sand, in Anchor Bay, with the eastern side of Wood Island, distant 3 cables, in line with the North extreme of Rage Reef, N.W. $\frac{1}{4}$ W. Rage Reef being nearly covered throughout at high water, the entrance is then not easily distinguished; it is better to enter at half-tide or low water.

Northward of Surf Rock, and between Ivory and Mary Islands, is the entrance to *Blair Inlet*; the inlet has numerous islands and rocks in it, and at its head is an Indian fishing station.

SEAFORTH CHANNEL, connecting Milbank Sound with Lama Passage (p. 522), has its western entrance between White Rocks and the rocks off Sound Point. Thence it extends 14 miles to E. by N., with an average breadth of 1 mile. The land on both sides is much broken by islands with channels between leading North and South. *Mouse Rock*, over which the sea generally breaks, lies 6 cables W. $\frac{1}{2}$ N. of Surf Point, on the North side of Seaforth Channel entrance. Between Sound Point and Gale Creek, $2\frac{1}{2}$ miles eastward, a bank extends a short distance off the shore, on which temporary anchorage may be found, with careful use of the lead, the bank being steep-to.

Kynumpt Harbour, on the South shore of Seaforth Channel, and about 2 miles westward from its junction with Lama Passage, may be recognised by *Grassy Islet*, 20 ft. high, and *Regatta Reefs*, lying in the middle of the channel $1\frac{1}{2}$ mile eastward of the harbour, also by *White Stone*, a conspicuous bare rock, 12 ft. high, lying 2 cables West of Kynumpt. The harbour is 4 cables long N.N.W. and S.S.E., and averaging 2 cables in breadth with 6 to 16 fathoms, mud; the best anchorage is in 7 to 9 fathoms, with the North extreme of Berry Point bearing E.N.E., and the West extreme of Low

Island N.N.E. A rock, with 10 f. water on it, is reported to lie 2 cables S.W. of Low Island. It is high water, on full and change, at 0^h 30^m; springs rise 14 ft., neaps 11 feet.

Dall Patch, with less than 6 ft. water on it, lies half a mile N.N.E. of the entrance to Kynumpt Harbour, and a shoal of 3 fathoms extends 1½ cable westward of it. To avoid *Dall Patch*, it is recommended to keep the southern shore on board, which in this vicinity may be approached to within 1½ cable.

MATHIESON CHANNEL is an extensive arm leading northward from Milbank Sound, eastward of Lady and Dowager Islands. At 2½ miles within the entrance it is obstructed by islands and rocks.

Port Blakeney, on the South side of Mathieson Channel, about 3 miles within the entrance, is easy of access, and may be approached from the south-westward with the swell astern. At its entrance, between Promise and Rain Points, the port is 2½ cables wide, thence it takes a southerly direction for about a mile, terminating in the mouth of a small creek insulating Mary Island. Wood and water may be obtained in Port Blakeney, and cod and other fish may be caught on Cod Reefs, and shell fish in the sandy bays.

Cod Reefs are a cluster of rocks at the mouth of Port Blakeney, the northern rock, with 24 ft. water over it, lying N.N.E. 3 cables from Promise Point, with a clear channel northward of it 1½ cable wide. *Oke Reefs*, about 2 cables northward of Cod Reefs, extend 2 cables from the South side of Oke Island. The outer detached rock is 3 ft. above high water.

Directions.—Approaching Port Blakeney from the southward, Helmet Peak should be kept just open of the eastern point of Lady Island, N. by E. ½ E., and when within 5 cables of the latter a N.E. ¼ N. course should be steered towards Oke Island. The clearing mark for leading between Oke and Cod Reefs should be brought on astern, namely, White Rocks in line with the North end of Passage Island, W. ½ N., and when Mark and Oke Islands are seen in line bearing N.W. by N. a vessel will be N.E. of Cod Reefs, and may then haul into the harbour, with the South extreme of William Island astern, bearing North, and anchor in 10 to 12 fathoms, sandy bottom, about 5 cables within the port, with Helmet Peak seen just open of Promise Point, N. by W. ½ W., and three-quarters of a cable S. by W. of a small sandy patch of 4 fathoms.

It is high water in Port Blakeney, on full and change, at noon; springs rise 13 ft., neaps 8 feet.

Off *Cross Point*, the S.W. point of Lady Island, and the northern entrance point of Mathieson Channel, a ledge extends 8 cables, and partially uncovers. At 1½ mile N.W. by W. from its extremity is *Boulder Head*, the South extremity of an island lying close off Lady Island. *Boulder Ledge*, with 1½ to 5 fathoms over it, extends 9 cables south-eastward of the head.

Vancouver Rock, uncovering 12 ft. at low water, is steep-to on all sides,
North Pacific.

and lies N.W. by W. $\frac{1}{2}$ W. distant $1\frac{1}{2}$ mile from Boulder Head, and S.W. by S. $\frac{1}{2}$ S. 1 mile from Cliff Island. Cross Point in line with Boulder Head, E. $\frac{1}{2}$ S., leads 6 cables southward of it.

Moss Passage (*Too-witt*), leads northward of Lady Island into Mathieson Channel, but at 3 miles within the entrance, and 1 mile from its junction with Mathieson Channel, it is barely a cable wide, and beyond that position it should not be attempted by a stranger. *Cliff Island*, on the North side of the entrance to Moss Passage, is small, 225 ft. high, and its S.E. extreme terminates in high, conspicuous white cliffs. *Bird Rock*, 3 ft. high, with a low ground extending 2 cables eastward of it, lies E. by S. 3 cables from the South extreme of Cliff Island.

Morris Bay, on the South side of Moss Passage, about 1 mile within the entrance, is $2\frac{1}{2}$ cables wide and extends 3 cables to the S.E. Westerly wind send in a swell, but the bay possesses the great advantage of permitting the state of the weather in Milbank Sound being ascertained when at anchor. Good water may be obtained here, and clams and cockles are in abundance. *Kitty Patch*, on the eastern side of Morris Bay, lies a cable from the eastern shore, with depths of 4 and 5 fathoms, sand.

Approaching Morris Bay, keep midway between Bird Rock and Salal Point, and if Vancouver Rock be uncovered, it should be kept astern bearing S.W. by W., westerly. The South extreme of Cliff Island open northward of Bird Rock, W. $\frac{1}{2}$ N., astern, will lead to the entrance. Anchorage will be found in 12 to 14 fathoms, sand, a cable from the western shore, with Salal Point shut in by the western entrance point, W. by S. $\frac{1}{2}$ S., and Detached Island, on the North side of Moss Passage, bearing N.N.W.

At two-thirds of a mile westward of Cliff Island are a group of islets, of which the largest is named *North Island*. Ledges extend 6 cables N. by W. $\frac{1}{2}$ W. from the island, and uncover at low water. *Alexandra Passage* lies eastward of Vancouver Rock and the North Island Group, and small steam-vessels, possessing local knowledge, make use of it. The passage is barely 6 cables wide in its narrowest part.

Low Point, the S.E. entrance point of Finlayson Channel, is low and wooded; at $2\frac{1}{2}$ miles W. by N. from it is the centre of *Beaver Bank*, about a mile in extent, on which a least depth of 27 fathoms was found, where a vessel might anchor in case of fog. *Sandstone Reef* is a conspicuous narrow ridge a mile long, part reaching 4 ft. above high water, the eastern end being about $3\frac{1}{2}$ miles W. by N. of Low Point, and about one-third of a mile off shore.

FINLAYSON CHANNEL is the main channel, from 1 to 2 miles wide, leading northward from Milbank Sound. From between Jorkins and Low Points it extends 3 miles northward; thence in a general N.W. by N. $\frac{1}{2}$ N. direction for 18 miles, and then N. $\frac{1}{2}$ E. 6 miles to the head of Carter Bay.

The land on both sides is from 1,000 to 3,000 ft. high, and both shores are thickly wooded.

Oscar Passage, 1 mile wide, leads eastward out of Finlayson Channel, between Dowager and Roderick Islands, to the channel leading northward from Mathieson Channel to Mussel Inlet. On its South side is *Stripe Mountain*, 2,020 ft. high. *Bulley Bay*, on the South shore, $3\frac{1}{4}$ miles within its western entrance, affords temporary anchorage in 15 fathoms, occasionally used by coasting vessels.

Sisters are two small wooded islets, about 90 ft. high, lying 2 cables from shore, $3\frac{1}{4}$ miles northward of Oscar Passage. They are 4 cables apart, and are joined by ledges uncovering at low water. *Nowish* or *Otter Cove* lies 5 cables northward of the Sisters, between Indian and Susan Islands. The entrance is 2 cables wide, and the cove thence extends E.S.E. for 5 cables, having on its North shore, about 4 cables within the cove, a small bay, which affords anchorage for small vessels in 10 to 14 fathoms, sand. *Jackson Passage*, northward of Nowish Cove, was unexplored. *Mary Cove*, $5\frac{1}{2}$ miles northward of the Sisters, is barely a cable wide at its entrance, and extends in a northerly direction for 5 cables, terminating in a sandy beach.

Cone Island, on the western shore of Finlayson Channel, is $3\frac{1}{4}$ miles long N.W. $\frac{1}{2}$ N. and S.E. $\frac{1}{2}$ S., and about 5 cables broad; its summit, about 1 mile from the South extreme, is conical, 1,280 ft. high. *Jane Island*, 5 cables northward of Cone Island, is about a mile long N.W. and S.E., and is low and wooded.

Sarah Island, 6 cables northward of Jane Island, is 15 miles long N.N.W. and S.S.E., and from 1 to $2\frac{1}{2}$ miles broad. This island reaches its greatest elevation of 3,000 ft. at 4 miles from its South extreme. On the S.E. side, at 7 miles from the South extreme, an unexplored bay faces south-eastward, and at $3\frac{1}{2}$ miles from this extreme are two high waterfalls.

Watson Bay, 9 miles northward of Sisters Islets, was unexplored. *Wallace Bight*, 2 miles northward of Watson Bay, and *Goat Cove*, 1 mile northward of Wallace Bight, both have very deep water.

Sheep Passage is nearly 1 mile wide, and leads eastward from the head of Finlayson Channel to *Mussel Inlet*, which is stated to have the same general characteristics as the other inlets.

CARTER BAY is an excellent stopping-place at the head of Finlayson Channel, and should be recognised by the high cliffs on its western shore. It is 4 cables wide at its entrance, and about 6 cables deep in a northerly direction, the head terminating in a large stream, fronted by an extensive sand-flat. There is anchorage in 14 to 15 fathoms, mud bottom, $1\frac{1}{2}$ cable from the eastern shore, and 2 cables from the sand-flat, with the entrance points bearing S.E. $\frac{1}{2}$ S. and S.W. by S. $\frac{1}{2}$ S. respectively. Water can be obtained from the stream, and here trout abounds. The shell-fish should not be eaten.

It is high water in Carter Bay, on full and change, at noon; springs rise

13 ft. The observation spot, on the western shore, is in lat. $52^{\circ} 49' 41''$ N., long. $128^{\circ} 24' 34''$ W.

Carter Bay and Mussel Inlet derive their names from one of Vancouver's party having died from the effects of poisonous mussels collected in *Poison Cove*, lat. $52^{\circ} 55'$, long. $128^{\circ} 1'$ W. The whole party who partook of them were seized with a numbness about their faces and extremities, which soon extended to their whole bodies, accompanied with sickness and giddiness. This may serve as a caution here, though generally the shell-fish is wholesome.

Hie Kish Narrows, about $5\frac{1}{2}$ miles long N.W. and S.E., and from $2\frac{1}{2}$ cables to 1 mile wide, lead from Finlayson Channel into Graham Reach. *Hewitt Rock*, with 10 ft. water over it, lies at the western entrance, nearly in mid-channel. The North shore of the channel should be kept on board to avoid it.

Klemtoo Passage, between Cone and Swindle Islands, is about $3\frac{1}{2}$ miles long N.W. and S.E., and in some parts barely a cable wide. Though narrow, this passage is safe, provided the mid-channel course be kept, and affords anchorage almost throughout. The tides are comparatively weak within it. It is high water, on full and change, at noon; springs rise 13 ft., neaps 8 feet.

South Passage, between Cone and Jane Islands, is 5 cables wide; when passing through it the South shore should be kept on board, passing 2 cables northward of Cone Island, to avoid *Kelp Patch*, a cable southward of Jane Island.

North Passage, between Jane and Sarah Islands, is 5 cables wide, and is to be preferred to South Passage. Keep nearer the North shore, and pass 2 cables South of Sarah Island, to avoid *Danger Patch*, of 1 to 3 fathoms, a cable north-westward of Jane Island.

TOLMIE CHANNEL, between Princess Royal and Sarah Islands, is about 15 miles long N.N.W. and S.S.E., and from a half to $1\frac{1}{4}$ mile wide. On the South shore, $2\frac{1}{2}$ miles northward of Sarah Island, an extensive arm takes a southerly direction, and is reported to communicate with Laredo Sound. Care is necessary, when approaching from the northward, not to mistake this unexplored arm for the reach leading to Klemtoo Passage.

Tolmie Channel, though not so wide as Finlayson Channel, is preferable in some respects, especially if compelled to be under way at night. The mid-channel course should be steered throughout, except when navigating the northern part of the channel, when the South shore should be neared to avoid *Tolmie Rock*, lying half a cable off the shore of Sarah Island.

Tides.—The flood stream, from the southward, is stronger in Finlayson than in Tolmie Channel. The ebb, however, is stronger in Tolmie Channel, and runs for $1\frac{1}{4}$ hour after the ebb has ceased in Finlayson Channel. In the narrow parts, both flood and ebb attain a velocity of 3 knots an hour at springs.

GRAHAM REACH, northward of Tolmie Channel and Hie Kish Narrows, is about 17 miles long N.W. by N. and S.E. by S., and from a half to 1 mile

broad. *Green Inlet* lying on the North shore, 2 miles northward of Sarah Island, was not explored. *Flat Point*, on the West shore, 3 miles north-westward of Green Inlet, is wooded, flat, and comparatively low, and near it lies a large boulder rock.

Swanson Bay lies on the North shore, 7 miles from Sarah Island. There is anchorage in 19 fathoms, sandy bottom, in the northern part of this Bay, with the conspicuous waterfall on the South shore of the reach shut in with the North entrance point.

Khutze Inlet, 6 miles N.W. of Swanson Bay, and *Aaltanhash Inlet*, 2 miles N.W. of Khutze, were both unexplored, and are reported by Indians to afford anchorage. Vancouver found scarcely any inhabitants hereabout. The tides meet abreast Aaltanhash Inlet. *Red Cliff Point*, the turning point into Fraser Reach, lies on the South shore.

FRASER REACH, the channel north-westward of Graham Reach, is 12½ miles long W. by N. and E. by S., and a half to 1½ mile wide. In its southern entrance lies *Wark Island*, 1½ mile long East and West, the channel on either side being deep. Abreast Wark Island is a bay on the South shore, at the head of which is a fine trout stream.

Klekane is an unexamined arm on the North shore, abreast Wark Island; the Indians report that anchorage may be obtained at the head. At *Landslip Point*, 4 miles W.N.W. of Wark Island, is a remarkable landslip. *Kingcombe Point*, at the North end of Princess Royal Island, and the turning point into McKay Reach, lies on the South shore, and is long, sharp, and conspicuous.

Opposite Kingcombe Point, on the eastern shore, is *Fisherman Cove*, where Vancouver anchored. About 2½ miles northward is a small inlet, where a hot spring was discovered.

In sailing among the rocky precipices which compose the shores of the channels hitherto described, it is not always safe to make too free with them in sailing by; for they are frequently found to jut out a few yards at or a little below low-water mark; and if a vessel should ground on any of those projecting points about high water, she would, on the falling tide, if heeling from the shore, be in a very dangerous situation.

To the N.N.W. of Fisherman Cove, *Ursula Channel* continues for about 7 miles between the main land and *Gribbell Island*. The shores are like the rest described, partly composed of lofty steep mountains rising nearly perpendicularly from the sea, and covered from the water side to their summits with pines and forest trees. *Boxer Reach* trends to the W.N.W. from Ursula Channel, and joins *Verney Channel*, which divides Gribbell from Hawkesbury Island. *Bishops Cove*, on the North side of Boxer Reach, has good anchorage in its N.W. part, in 15 to 20 fathoms. From Boxer Reach *Devastation Channel* trends first to the eastward, and then northward. *Point Staniforth*, placed by Vancouver in lat. $53^{\circ} 34'$, long. (corrected) $128^{\circ} 47' W.$, is the South entrance point of Gardner Channel.

GARDNER CHANNEL runs 4½ miles in an irregular course to the eastward, *Kittup River* running into its head. Its upper part passes through a country that is almost an entirely barren waste, nearly destitute of wood and verdure, presenting to the eye one rude mass of almost naked rocks, rising into lofty mountains, whose towering summits, seeming to overhang their bases, give them a tremendous appearance. The whole is covered with perpetual ice and snow, and many waterfalls descend in every direction in the summer.

Douglas Channel lies between the West coast of Hawkesbury Island and the main land, and extends about 43 miles from the North end of Promise Island to its head. About 27 miles from its head it is joined by Devastation Channel.

The Admiralty survey did not extend to the waters of Douglas and Gardner Channels. The navigation is, however, considered to be free from obstruction. Her Majesty's ships have at different times visited these localities, and the charts, as corrected from observations resulting therefrom, as also from information furnished by the Government of Canada, may be taken, under ordinary conditions of weather, to be a sufficient guide, in the hands of a careful navigator.

In Douglas Channel, at *Kit-kia-tah*, 6 miles North of Promise Island, small vessels may anchor in 5 fathoms, half a mile within the inlet. In *Kit-i-mat* Arm, in *Clio Bay*, near the head, anchorage will be found in 17 fathoms. This place is used by Her Majesty's ships when communicating with the *Kit-i-mat* Indians.

In Gardner Channel, *Richardson Point* is said to afford anchorage on each side of it, in from 18 to 5 fathoms. Also at *Kemano Bay*, anchorage of an indiffererent character may be obtained.

McKAY REACH, leading westward of Fraser Reach into Wright Sound and Whale Channel, is about 8 miles long W.S.W. and E.N.E., and from 1 to 2 miles wide. The land on the North shore is high and bold, with mountains 3,000 ft. high. The land on the South shore is not so high; and near the summits of the mountains are some extensive slate-coloured patches.

WRIGHT SOUND is a large sheet of water, 9 miles long East and West, and 2½ miles wide at its narrowest part. Grenville Channel extends from its western part; Whale Channel and Lewis Passage lead southward; and Douglas Channel and Verney Passage lead northward. *Gil Island*, on the South side of the sound, culminates in a well defined snow-clad peak 3,000 ft. high.

Holmes Bay (*Quel-ak-sea-ha*), on the eastern shore of the sound, at the entrance of Whale Channel, is 8 cables wide, and recedes in an easterly direction for about 4 cables, terminating in a sand-flat. A small islet lies off the South entrance point. There is anchorage in 14 fathoms, sand, with Gil Mountain in line with the South entrance point, S.W. by W. It is high water, on full and change, at 1^h; springs rise 13 ft., neaps 10 feet.

The North point of Gil Island is opposite Point Cumming, the S.W. extreme

of Gribbell Island. There is anchorage in a bay on the N.E. part of the island, about a mile eastward of *Turtle Island*, its northern extremity. Here Vancouver anchored in 40 fathoms, stones, shells, and sandy bottom, and called it *Fisherman Cove*. There is also said to be anchorage to the S.W. of the North point of Gil Island. Gil Island, with the islands to the S.W., and the channels dividing them, are described hereafter (p. 543).

PROMISE ISLAND, at the South end of Douglas Channel, is $3\frac{1}{2}$ miles long N.N.W. and S.S.E., with an extreme breadth of 2 miles. It is covered with pine and cedar, and culminates in two dome-shaped peaks, 1,680 and 1,710 ft. high respectively. *Cape Farewell*, its S.E. extreme, terminates in a high, bold cliff, and a ledge, uncovered at low water, extends 2 cables S.E. of it. A conspicuous white cliff lies midway between Cape Farewell and Thom Point. *Dawson Point*, the North extreme, is low and wooded, and a ledge extends 2 cables northward of it, uncovered at half ebb.

Coghlan Anchorage, about a mile westward of Cape Farewell, is 3 cables wide at its entrance between Camp and Thom Points, and extends 2 miles to the N.W., widening within to 4 cables. Ledges extend a short distance off the projecting points. *Harbour Rock*, a dangerous rock of small extent, uncovers 6 ft. at low water, and lies nearly in mid-channel near the head of the harbour, and is nearly steep-to. *Otter Shoal* extends 100 yards from the western shore, at the head of the anchorage, with depths of 3 fathoms and less upon it.

Anchorage in 6 to 7 fathoms, sand, will be found near the head of Coghlan Anchorage, or, for a long vessel, or those not wishing to go beyond Harbour Rock, a berth in 24 fathoms, in mid-channel, at 5 cables S.E. of Observation Point, may be found. It is high water at the anchorage, on full and change, at 0^h 30^m; springs rise 18 ft., neaps 14 ft. *Stewart Narrows*, the channel leading northward of Promise Island into Douglas Channel, is narrow and not recommended.

Tides.—The flood stream enters Campania Sound from the southward, and the main body passes up Squally Channel. The lesser body, passing into Whale Channel, unites at 1 mile northward of Turtle Point with the main body from Lewis Passage. Thence it sets directly across Wright Sound, and impinging against Camp Point, causes very strong eddies there, and is then deflected towards Grenville Channel. Portions of the flood stream by Whale Channel turn into McKay Reach, Douglas Channel, and Verney Passage. On the ebb, the reverse takes place, the main body of water from Wright Sound, &c., obtaining an exit by Whale Channel. Both flood and ebb streams attain the velocity of 3 knots an hour, at springs, in the contracted portions of the channels.

GRENVILLE CHANNEL, leading north-westward from Wright Sound, is the usual channel taken by steam-vessels proceeding to the northern waters of British Columbia. A vessel should keep as nearly as possible in mid-channel.

At its S.E. end it is 8 cables wide, and thence it extends 4 miles W. by N. $\frac{1}{4}$ N. to abreast Davenport Point, with an average width of 1 mile. From this point it trends W.N.W. for 11 miles, and narrows to 3 cables as Lowe Inlet is approached, seldom exceeding 4 cables in width until north-westward of Evening Point, Klewnuggit. From off Lowe Inlet, the channel takes a N.W. by W. $\frac{3}{4}$ W. direction for 7 miles, to abreast Evening Point; thence it gradually widens out from 1 to 3 miles, and extends W. by N. $\frac{1}{4}$ N. for 23 miles, to Ogden Channel. For 2 miles within it Mr. Whidbey (July, 1793) found the sea abounding in sea-otters, which sported about the boats.

The land on both sides is high, reaching the elevation of 3,500 ft. on the North, and from 1,000 to 2,000 ft. on the South shore, and, as a rule, densely wooded with pine and cedar. The mountains rise almost perpendicularly above water, and cause the southern portion of this narrow channel to appear even narrower than it is. But the general effect of so many mountains rising one behind the other renders Grenville Channel one of the most beautiful landscapes on this coast, and is equalled only by Klemtoo Passage.

At springs the flood stream in the narrow portions of Grenville Channel attains the velocity of 2 knots, and the ebb 4 knots an hour. Abreast Lowe Inlet, strong eddies will be felt on the ebb.

Lowe Inlet (*Kumocadah*), about 14 miles from Wright Sound, is about $2\frac{1}{2}$ cables wide at its entrance between James and Hepburn Points. From mid-channel, between the entrance points, the inlet extends 5 cables N. by E., and thence N.N.E. for 6 cables, to the mouth of *Nettle Basin*, which is nearly circular in shape, with 15 to 17 fathoms water, over mud, and is 5 cables in diameter, but its entrance is barely a cable wide. A large stream flows into the N.E. corner of the basin, with a waterfall close to its mouth. Water may be procured here, and trout caught in the stream.

On the South shore of Grenville Channel, at 2 miles S.E. of Lowe Inlet, is a remarkable bare hill, 400 ft. high. *Tom Islet* lies close to the North shore at 2 cables westward of the inlet. On the South side of the inlet, *Anchor Cone*, a remarkable mountain, rises to the height of 2,010 ft. *High-water Rocks*, 1 cable from the western shore, at 4 cables within Lowe Inlet, cover at high water.

Anchorage for vessels of moderate length will be found, in mid-channel, at 2 cables within the inlet, in 8 and 10 fathoms, sand and shells. For a long vessel, more convenient anchorage will be found higher up the harbour, in mid-channel, in 20 fathoms, mud, with Anchor Cone Mountain bearing S.E. by E. It is high water, on full and change, at 0^h 30^m; springs rise 17 ft., neaps 15 feet.

Morning Reefs extend N.W. by W. nearly 1 mile from Evening Point; the South shore of Grenville Channel must be kept on board when passing them.

Klewnuggit Inlet lies 9 miles W.N.W. of Lowe Inlet, and 1 mile west-

ward of Evening Point. The entrance lies between Camp Point and Leading Island, and is 4 cables wide. Thence the inlet takes an easterly direction for 4 cables, and there divides; the longer arm, *Exposed Arm*, extends in a S.E. direction for 3 miles. The shorter arm extends N.W. for $1\frac{1}{4}$ mile, passing northward of Leading Island, and is $2\frac{1}{2}$ cables wide. Anchorage may be obtained at *Ship Anchorage*, in the N.W. arm, in 15 to 20 fathoms, mud, in mid-channel. Exposed Arm is very deep. It is high water, on full and change, at 0^h 30^m; springs rise 17 ft. The tidal streams meet abreast Evening Point.

Stuart Anchorage, on the South shore of Grenville Channel, 17 miles W. by N. $\frac{1}{2}$ N. of Klewnuggit Inlet, lies 5 cables westward of a long, low, wooded projection, which serves to distinguish it. *Stag Rock*, uncovering 13 ft. at low water, lies 4 cables W. by N. $\frac{1}{2}$ N. from this point, and has foul ground extending from it 4 cables in a W.N.W. direction; a small patch, uncovered at low water, lies 1 cable South of the rock. Anchorage will be found in 10 to 15 fathoms, rock, W. $\frac{3}{4}$ S. 2 cables from Stag Rock, but in proceeding for this anchorage, especially at high water, care is necessary.

False Stuart anchorage lies on the South shore, 3 miles E.S.E. of Stuart Anchorage. On its N.W. side is a high, bold projection, which should serve to distinguish it from Stuart Anchorage. The water is deep, close to the shore.

Kxn-geal Inlet, on the North shore, 5 miles westward of Evening Point, and *Kum-ea-lon Inlet*, abreast of False Stuart anchorage, were both unexplored.

Gibson Islands are a group of islands, situated in the junction of Grenville Channel with Ogden Channel. The western and largest island is 160 ft. high, about 1 mile in extent, and wooded. On its East side is *Bloxham Island*, of small extent. *Watson Rock*, uncovering 11 ft., lies 2 cables off the South shore of Gibson Island. A rock lies half a mile W. by S. from the South end of Bloxham Island, and *Bloxham Shoal* extends 6 cables north-eastward from the same end, and passes northward of Gibson Islands at that distance, with depths of 1 to 3 fathoms over it. *Gunboat Harbour*, between Gibson and Bloxham Islands, affords temporary anchorage to small vessels, in 4 to 10 fathoms, a cable within the entrance. The continental shore, eastward of Gibson Islands, is lined with numerous rocks and islets.

Bedford Island, of small extent, lies N.N.W. 5 cables from Gibson Island, and a spit extends 3 cables S.W. of it. The channel between the islands is not recommended, having less than 4 fathoms in it. *Marrack Island* lies 5 cables N.N.W. of Bedford Island, and *Marrack Rock*, which uncovers, lies nearly in mid-channel between them.

Kennedy Island, about a mile northward of Marrack Island, is $5\frac{1}{2}$ miles long N.W. and S.E., with an average breadth of 3 miles. It is wooded, and rises near the middle in two conspicuous peaks, 2,765 and 2,470 ft. high

respectively. *Cardena Bay*, on the S.E. side, is fronted by a mud bank, which extends over 5 cables from the shore, on which anchorage may be found in 7 to 8 fathoms, 3 cables from the shore.

Port Fleming.—Between Marrack, Bedford, and Gibson Islands and the mainland, there is a good harbour of even soundings from 3 to 7 fathoms, with muddy bottom and very little current, as the tides meet here and form still water. This basin I have named Port Fleming. Capt. Madden, an old truder and pilot, stated that he always found this harbour good, well-sheltered from wind, and free from currents and sea, and considered it the best between Port Simpson and Vancouver Island for large or small ships.*

Lewis Island, 1 mile S.W. of Kennedy Island, is low and wooded. In *Lawson Harbour*, on its N.W. side, small vessels may find anchorage in 4 fathoms, about 1 cable within the entrance.

Arthur Passage, between Kennedy and Lewis Islands is about 5 miles long, N.W. and S.E., and about 1 mile wide. *Herbert Reefs*, uncovered at low water, lie on the West side of the passage, about 5 cables from the N.E. extreme of Lewis Island. This dangerous cluster consists of two rocks, 5 cables apart N.W. and S.E.

Elliott and Elizabeth Islands, north-westward of Lewis Island, are both low and wooded. *Bampfild Islets* lie 2 cables off the North shore of Elizabeth Island. *Bloxam Passage*, between Lewis and Elliott Islands, is about 2 cables wide, with a depth of 21 fathoms in mid-channel. At *Chalmers Anchorage*, on the N.W. side of Elliott Island, anchorage may be found in 13 to 14 fathoms, 2 cables from the N.W. extreme of the island.

Chismore Passage, between Porcher Island and Lewis, Elliott, and Elizabeth Islands, is about 4 miles long W.N.W. and E.S.E., and from 2 to 5 cables wide. *Elizabeth Rock*, which uncovers, lies 1 cable off the South shore of Elizabeth Island, at 1 mile within the western entrance of the passage. There is anchorage in mid-channel, in 7 to 10 fathoms, 2 cables off the South shore of Elliott Island, with Genn Islands seen midway between Elliott and Elizabeth Islands, bearing N.W. by N.

White Cliff Island, at 6 cables northward of Elliott Island, is about half a mile long North and South, its South extreme terminating in high, white cliffs. A ledge extends 2 cables southward of the island, and there is a depth of 30 fathoms, mud and shells, at 1 cable southward of this ledge. *Cecil Patch*, with 4 fathoms on it, lies West 1 mile from the South extreme of White Cliff Island. *Genn Islands* are two small wooded islands, about 120 ft. high, lying close together; the eastern one lies N.W. by W. $\frac{1}{2}$ W., 2 miles from White Cliff Island. *Bribery Island*, small and wooded, lies W. by S. 8 cables from

* From a Report by Captain J. C. Brundige, published in a Report in reference to the Canadian Pacific Railway, by Sanford Fleming, Esq., Ottawa, 1880; containing much interesting information on the harbours and northern coast of British Columbia.

the western Genn Island. *Lawyer Islands* are about 1 mile in extent, N.W. by W. and S.E. by E.; the eastern island lies W. by S., 5 cables from Bribery Island. *Cruise Rock*, covering at three-quarters flood, lies W. $\frac{1}{2}$ N., 3 cables from the western Lawyer Island.

Malacca Passage, between Porcher Island and the Genn and Lawyer Groups, is about 6 miles long W. by N. and E. by S., and about $1\frac{1}{2}$ mile wide. The summit of Kennedy Island, having bare patches on the N.W. side, in line with the South extreme of White Cliff Island, E. by S., will lead through.

SKEENA RIVER, the largest river on the coast of British Columbia northward of Fraser River, rises in Lake Babine, about 200 miles beyond Port Essington. For about 20 miles above Port Essington the river is available for vessels drawing 4 ft.; beyond that distance it is only navigable for canoes. The head of navigation, for vessels drawing over 6 ft., may be said to terminate 6 miles beyond Port Essington, and 21 miles from the mouth of the river. Steamers from Nanaimo ascend the river, it being one of the routes to the Omineca gold mines.

It is a prolific salmon stream, and there are three canneries on its banks—one at Aberdeen, another at Inverness Slough, and a third at Port Essington, near its mouth, where there is a small village of traders, fishermen, and Indians. The river is navigable for light-draught steamers as far as Mumford Landing, 60 miles inland, and 200 miles further for canoes. There are two missionary stations on the river, and along its course are many spots favourable for settlements.—*The West Shore*, September, 1884.

At 6 miles below Port Essington, the river divides into three channels, called North, Middle, and Telegraph Passages. The salt water, as far as Port Essington, is stated to be of a light-blue colour, similar to that near Fraser River. In winter large masses of ice drift about with the tide, and the river is stated to freeze over at 6 miles below Port Essington.

Coal is found on the banks of the Skina or Skeena River. It was visited by Mr. Downie in August, 1859, and may prove to be an important attraction at some future period.* Gold is found in small quantities; also plumbago. Potatoes are good and plentiful.

The entrance of Skeena River is an extensive sound, surrounded by a moderately elevated country, particularly on the N.W.; but to the North and East the view is bounded by lofty barren mountains, covered with perpetual

* Mr. Downie says: At Kitsagatala (on the Skina River) we entered on a most extensive coal country, the seams being in sight and cut through by the river, and running up the banks on both sides, varying in thickness from 3 to 35 ft. The veins are larger on the East side, and are covered with sandstone; on the West side quartz lines the seams, which are smaller. The veins dip into the bank for a mile along the river, and could easily be worked by tunnels on the face, or by sinking shafts from behind on the flats, as they run in soft earth. I have seen no coal like this in all my travels in British Columbia and Vancouver Island. (See *Capt. Mayne*, Appendix, p. 451.)

snow. The entrance is narrowed by a shoal against *Point Lambert*, forming a rounding spit, of 3 to 6 ft. water. The tide rushes in furiously.

Telegraph Passage, the southern and principal channel of Skeena River, is about 8 miles long N.W. by N. and S.E. by S., with an average width of $1\frac{1}{2}$ mile. The western side is rendered dangerous by sand flats, some of which dry, extending from the eastern side of Kennedy Island, but the eastern side has depths of $4\frac{1}{2}$ to 17 fathoms.

Unless under the guidance of a pilot, as the channels of the Skeena are subject to periodical changes, it is recommended, before attempting them, to buoy the channel.

Port Essington lies on the South shore, about 5 miles from De Horsey Island, and abreast it anchorage will be found in mid-channel, in 4 to 6 fathoms, mud. Here there is a village and salmon canneries. *Raspberry Islands*, eastward of Port Essington, lie close to the eastern shore, and were so named by Vancouver from the quantity of excellent raspberries he found here.

A heavy cross-sea is caused by strong winds from N.W. to S.E., and vessels riding at anchor in the current here during a gale of wind, would be sure to foul and trip their anchors.—*Capt. J. C. Brundige*.

De Horsey Island lies about 1 mile northward of Kennedy Island, and between them is *Middle Passage*, which should not be attempted by a stranger. It is about a mile wide between the islands, but mostly occupied by shoals, which contract it to a very narrow channel close to the southern side. To the N.W. of this channel Chatham Sound is interspersed in most directions with small islands, rocks, and shoals.

North Passage lies between Tsimpsean Peninsula and Smith and De Horsey Islands. *Mount McGrath*, on Smith Island, is conspicuous, being 2,200 ft. high. The navigable channel is barely a cable wide in some parts. Anchorage will be found at 1 mile within the passage, off Woodcock Landing on the North shore, nearly in mid-channel, in 8 to 10 fathoms.

Tides.—The night tides rise higher than those of the day; the latter rising 24 ft. at springs. The flood stream at the entrance attains the velocity of 4, and the ebb 5 knots an hour at springs.

Having given a description of the inner channels northward of Milbank Sound (p. 526), we now proceed to describe the outer islands and the channels among them. Game abounds on all the off-lying islands, and notwithstanding the presence of wolves, deer are in great numbers. Water is plentiful at all seasons, and trout may be procured in the streams.

LAREDO SOUND, between Price and Aristazable Islands, is nearly 20 miles long N.N.W. and S.S.E., and from 3 to 14 miles wide. The eastern shore is low, wooded, and much broken into bays and creeks. The West coast of Price Island is fringed by several islets, rocks awash, and sunken rocks, to

the distance of 2 miles. A group of islands and islets extend southward from Aristazable Island.

Nab Rock, a dangerous sunken rock, over which the sea only breaks at long intervals, lies S.E. by E. distant $3\frac{1}{2}$ miles from the summit of Entrance Island, off the South end of Aristazable Island. The ground is foul for 1 mile S.E. of the rock, and several ledges uncover between it and Entrance Island.

Kititsu Hill, at the West entrance of Schooner Passage (p. 527), is of triangular shape, with a well-defined summit 760 ft. high. Over the North shore of the sound rise three remarkable mountains, *Needle Peaks* and *Cone Mountain*, 2,400 to 2,800 ft. in height.

Don Point, on the western shore, 4 miles N. by E. from the summit of Entrance Island, is a peninsula 150 ft. high. *Schooner Point*, the turning point into Laredo Channel, lies N. by W., 7 miles from Don Point, the coast being bold and rocky. A ledge, which uncovers, extends 3 cables northward of Schooner Point. *Steep Point*, high and bold, forms the N.E. entrance point of Laredo Channel, and lies N. by E., 2 miles from Schooner Point.

Directions.—Small sailing coasting vessels, to avoid the light winds and calms which frequently prevail in the inner channels, make use of Laredo Sound and the channels leading northward from it, as here the wind seldom fails them. In clear weather, if Outer Island, off the South end of Price Island, be not brought to bear southward of East, a vessel will pass South of Nab Rock. Kititsu Hill, bearing N. $\frac{1}{4}$ E., will lead eastward, and Schooner Point bearing N.N.W. leads northward of Nab Rock.

LAREDO CHANNEL, between Princess Royal and Aristazable Islands, is about 20 miles long N.W. by W. and S.E. by E., and from 2 to 5 miles wide. At 6 miles within the entrance it is obstructed by a group of islands and islets, contracting the navigable channel, on their northern side, to barely 7 cables wide.

Beaver Ledge, uncovering at low water, lies 5 cables from the South shore, at $1\frac{1}{4}$ mile westward of Schooner Point. *South Channel Islands* are 150 ft. high, and about a mile in extent East and West. *North Channel Islands* are of small extent; the eastern island lies N.W. by W., $1\frac{1}{4}$ mile from the western island of the South Channel Group. *Channel Rock*, a dangerous sunken rock, lies nearly in mid-channel, S.E. by E. 6 cables from the eastern islet of the South Channel Group.

Bluff Point, on the southern shore, 2 miles W.N.W. of the North Channel Islands, is high and bold, with a hill 400 ft. high rising immediately over it. *Seal Rocks*, covered at high water, lie 5 cables from the South shore, and 2 miles W.N.W. from Bluff Point. *Sandspit Point*, $5\frac{1}{2}$ miles N.W. by W. from Bluff Point, is white and conspicuous, with a ridge of bare hills, 700 to 900 ft. high, over it. A shoal extends 5 cables northward of Sandspit Point.

Devils Point, the western entrance point of Laredo Channel, lies W.N.W.

4 miles from Sandspit Point; over it is a bare hill, with a conspicuous knob on its summit. *Spray Point*, the N.E. entrance of the channel, is bold, and lies E.N.E., 5 miles from Devils Point.

Tides.—The flood stream from Laredo Sound, and the ebb from the northward, both increase in strength as the Channel Island Group is approached, attaining the velocity of 6 knots an hour at springs in *Surge Narrows*, the channel North of that group. In the wider portions both streams attain the velocity of 3 knots an hour at springs. Midway between Devils and Spray Points, the flood stream by Laredo Channel is met by the stream passing round the N.W. end of Aristazable Island, causing at springs dangerous tidal races in that locality.

ARISTAZABLE ISLAND is about 26 miles long N.W. and S.E., and from 1 to 10 miles broad, and wooded. At about 8 miles from its S.E. extreme is a conspicuous saddle-shaped hill, 640 ft. high. Near the northern end of the island, a bare ridge of hills, with four conspicuous peaks, rises to the height of 950 ft. Over the S.W. extreme are some bare hills 350 ft. high, and at the extreme western end is a remarkable knob on the summit of a bare hill. The southern shores are broken into bays and creeks, obstructed by islets and sunken rocks; and there are several off-lying groups of islands.

Entrance Island, $1\frac{1}{2}$ mile southward of the South extreme of Aristazable Island, is the outer island of a wooded group extending off the point. *White Rock*, 100 ft. high, bare and conspicuous, lies N.W. by W., 3 miles from Entrance Island, and is the outer rock of a group extending 2 miles from the shore. *Sentinel Island*, 250 ft. high, small, wooded, and conspicuous, lies $1\frac{1}{2}$ mile from the shore, at 4 miles W. $\frac{1}{2}$ N. from White Rock. Several rocks, awash and sunken, lie northward of Sentinel Island, fringing the South shore of Aristazable Island. The two most outlying rocks, which are from 1 to 2 ft. above high water, lie respectively W. by N. 1 mile, and W.N.W. $4\frac{1}{2}$ miles from Sentinel Island.

Gander Islands (*Cha-che-Kwas*) are a group of islands, islets, and rocks, extending 10 miles N.N.W. and S.S.E., and 4 miles wide, at about 6 miles from the South shore of Aristazable Island. The larger islands of the group are wooded, the tops of the trees being from 70 to 150 ft. above high water. *North Gander Island*, the northernmost and largest, is about 2 miles long N.N.W. and S.S.E., and half a mile broad. *South-east Gander Islands*, 100 ft. high, are two small wooded islands, 3 miles S.E. by E. from South Gander Island. *Goose Ledge*, which uncovers, lies 3 miles S. by W. from S.E. Gander Islands, and 3 miles S.E. $\frac{1}{2}$ S. from South Gander Island. *Sparrowhawk Breakers* were reported by H.M.S. *Sparrowhawk*, 1869, to lie respectively 4 and $6\frac{1}{2}$ miles S. by E. from the S.E. Gander Islands.

Tide Rip Islands consist of two groups lying N.N.W. and S.S.E. 2 miles apart, the southern group lying 2 miles N. W. of the Gander Group. They are 7 miles in extent, N.N.W. and S.S.E., are wooded, and about 200 ft. high.

The northern and largest island terminates, at its N.W. extreme, in conspicuous white cliffs. At springs the tidal streams attain a rate of 4 knots an hour among these islands.

The Gander and Tide Rip groups and their vicinity, not having been thoroughly examined, the channels between them should not be attempted by a stranger.

Campania Sound, between Princess Royal Island and the South end of Campania Islands, is 5 miles long N.N.E. and S.S.W., and 3 miles wide. On the eastern shore, a conspicuous ridge of rounded hills rises to the height of 900 ft., and ledges extend as far as 5 cables from the shore. At 3 cables from the S.E. extreme of Campania Island lies *Eclipse Island*, small and wooded, 100 ft. high. For 1 mile northward of Eclipse Island, ledges uncover to the distance of 5 cables off shore. *South Surf Islands*, at the S.E. entrance of the sound, consist of three wooded islands 250 ft. high, with several small, rocky islets. *North Surf Islands*, 250 ft. high, three-quarters of a mile W. by N. $\frac{1}{2}$ N. from South Surf Islands, consist of three wooded islands, 1 mile in extent N.N.W. and S.S.E.

Squally Channel, between Gil and Campania Islands, is 10 miles long E.S.E. and W.N.W., and from $2\frac{1}{2}$ to $4\frac{1}{2}$ miles wide. Violent squalls will often be experienced here, descending from the high land of Campania Island, when calms or light winds and smooth water will be found in Whale Channel.

Gil Island, named *Ysla de Gil* by Señor Caamano, in 1792, forms the North side of Squally Channel, and is 15 miles long N.W. by N. and S.E. by S. by 6 miles broad. *Mount Gil*, 3,000 ft. high, lies near the N.E. end, and its summit is clad with snow on the North side. A ridge of mountains, 1,500 to 2,000 ft. high, extends in a southerly direction from Mount Gil, curving gradually to the south-eastward. The S.E. extreme of Gil Island is wooded, flat, and low.

Channel Reef, uncovering at low water, extends 5 cables from Ledge Point, the South extreme of Gil Island, and fringes the shore at the same distance for $1\frac{1}{2}$ mile to north-westward. *Windy Islets* are three in number, the outer one lying 5 cables from the shore, at 2 miles westward of Ledge Point. *Windy Rock*, uncovered at low water, lies 5 cables E.S.E. from the outer islet. *Black Rock*, 2 cables from the West extreme of Gil Island, covers at high water, and is nearly steep-to.

Lewis Passage, between Gil and Fin Islands, takes a northerly direction for 4 miles, and thence trends to N.W. for 4 miles, into Wright Sound, with an average width of $1\frac{1}{2}$ mile.

Fin Island, 2 miles westward of Gil Island, is 4 miles long North and South. *Plover Point*, its North extreme, has a large bay close southward of it, with several islets lying in it, and drying throughout at low water. Four bare rocky islets fringe the North shore. *Fin Rock*, awash at high water, lies 2 cables from the South extreme of Fin Island.

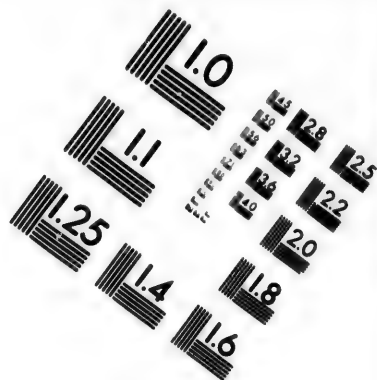
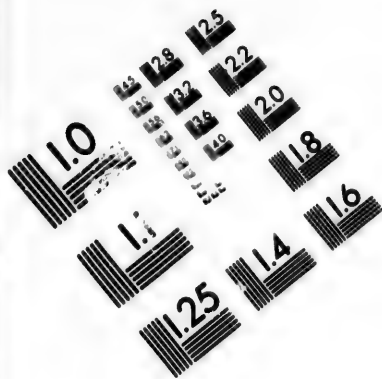
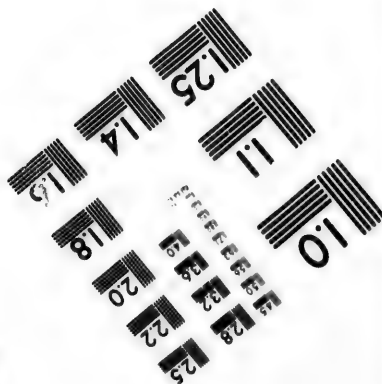
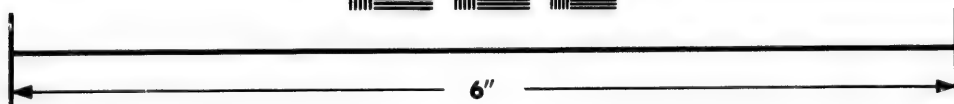
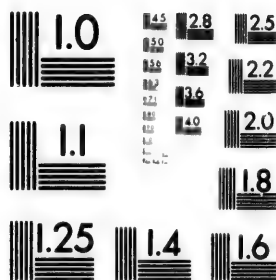
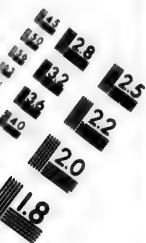


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Cridge Passage, between Fin and Farrant Islands, is 3 miles long E.N.E. and W.S.W., and 1 mile wide.

Farrant Island, at the S.E. entrance of Grenville Channel, is 9 miles long W.N.W. and E.S.E., and from 4 to 6 miles broad, reaching an elevation of 1,700 ft. on its South side. *Block Head*, the eastern extreme, terminates in a high white cliff. *Yolk Point*, the N.E. extreme, lies N.W. 4 miles from Block Head and is smooth, bare, and rocky. *Union Passage* (Matliksimtas), between Farrant and Pitt Islands, was not explored.

Whale Channel, between Princess Royal and Gil Islands, is 12 miles long N.W. by N. $\frac{1}{2}$ N. and S.E. by S. $\frac{1}{2}$ S., and from 2 to 3 miles wide. *Leading Point* lies on the eastern shore, 5 miles southward of Holmes Bay (p. 534), and over it is a conspicuous hill of triangular shape, 700 ft. high. *River Bight*, between Holmes Bay and Leading Point, has a large river at its head.

Maple Point, on the western shore, abreast of Holmes Bay, is comparatively low, with maple trees growing on it. At 1 mile South of it is a sandy bay, with a conspicuous sandy beach at its head. *Shrub Point*, 5 miles southward of Maple Point, is comparatively low. *Camp Islet* lies 2 cables off shore, at 9 miles southward of Maple Point. It joins the shore at low water, and South of it is a bay, 1 mile wide at its mouth, but occupied by a ledge of rocks.

Barnard Cove lies eastward of *Trouble Island*, at the South entrance of Whale Channel, and affords shelter to boats and small craft, in 20 fathoms, mud, 2 cables from the eastern shore.

Passage Island, at the junction of Whale Channel and Campania Sound, is 2 miles long North and South, the tops of the trees being about 250 ft. above high water. Off its S.E. side, a group of islets and rocks extends 5 cables south-eastward. The passages East and West of it are deep, and 6 cables wide.

Estevan Sound, between Estevan and Campania Islands, is about 15 miles long W.N.W. and E.S.E., and from $2\frac{1}{2}$ to 5 miles wide. At its S.E. entrance are several islets and rocks, nearly in mid-channel; to a stranger, therefore, Estevan Sound cannot be recommended. If compelled to use it pass three-quarters of a mile northward of South Watcher Islet.

Campania Island is nearly 15 miles long W.N.W. and E.S.E., and from 1 to 4 miles broad. It has a conspicuous ridge of mountains, which culminates in two bare dome-shaped summits, 2,000 ft. high, furnishing an excellent landmark. When seen from eastward a remarkable peak, nearly in the centre, appears to rise considerably above the rest. The western end of the island is comparatively low and wooded. *Marble Rock*, 5 cables N.W. of the N.W. extreme, is 6 ft. above high water, small, white, and conspicuous. The northern shore is bold, and the N.E. extreme terminates in a high white cliff. The southern shore is low and wooded, fringed by islets and rocks to the distance of 1 mile.

South Watcher is a small wooded islet, 100 ft. high, lying nearly in mid-channel at the eastern entrance of Estevan Sound, S.W. $\frac{1}{2}$ W., $3\frac{1}{2}$ miles from

Eclipse Island, and N.E. by E. $\frac{1}{2}$ E. $3\frac{1}{2}$ miles from *Breaker Point*. *Ledges*, which uncover, extend 5 cables N.W. and S.E. of it. *North Watcher Islet*, 60 ft. high, lies W. $\frac{1}{2}$ N. $1\frac{1}{2}$ mile from the *South Watcher*, and is surrounded by ledges and sunken dangers to the distance of 8 cables. *Blinder Rock*, breaking occasionally, lies S.W. by W. 1 mile from the *South Watcher*. *Estevan Ledge*, which uncovers, is a cable in extent, and lies 8 cables West of the *North Watcher*. *Breaker Point*, the S.E. extreme of *Estevan Island*, is low and wooded, and *Don Ledge*, which uncovers, extends 6 cables E.N.E. of it. *Breaker Reef*, which nearly always breaks, extends nearly $1\frac{1}{2}$ mile from the shore, the outer rock lying $2\frac{1}{2}$ miles S.W. of *Breaker Point*. *Trap Rocks*, some awash at high water, extend 8 cables northward of the North extreme of *Estevan Island*; and thence front the western end of the island at the distance of 6 to 2 cables.

ESTEVAN ISLAND is about 14 miles long W. by N. and E. by S., and from 2 to 5 miles broad. Its southern shores are comparatively low and wooded. Near the centre it attains an elevation of 1,500 to 1,700 ft., forming a saddle-shaped mountain.

Haycock Island, small, bare, and 60 ft. high, lies W. by S. $\frac{1}{2}$ S., 7 miles from *Breaker Point*, and *Haycock Rocks*, three rocks awash, lie respectively W. by S., S. by E., and N. by E., distant 1 mile from it. The passage between *Haycock* and *Estevan Islands* should not be attempted.

Curtis Rock, breaking occasionally, lies 1 mile S.S.W. of *Curtis Point*. *Marchant Rock*, over which the sea breaks at low water, lies 2 miles South of *Cox Point*, the West extreme of *Estevan Island*, and $1\frac{1}{2}$ mile from the nearest shore.

Cone Islet, small, wooded, and 250 ft. high, is the southernmost of the *Block Islets*, and lies at the southern entrance of *Otter Passage*, at 2 miles from the shore of *Banks Island*.

Otter Passage leads to *Nepean Sound*, between *Estevan* and *Banks Islands*; though nearly $1\frac{1}{2}$ mile wide, it is obstructed on its western shore by *Block Islets*, which contract the navigable channel to barely 4 cables wide in places. This narrow channel is rendered more dangerous by the strong tides within it, and in no case should *Otter Passage* be attempted, except at slack water and with local knowledge.

NEPEAN SOUND, between *Estevan Sound* and *Principe Channel*, is about 7 miles long and 4 miles wide. *Otter Channel* leads westward from it to *Squally Channel*, and is about $3\frac{1}{2}$ miles long; *Steep Point*, its N.E. entrance point, terminates in a high white cliff.

To the northward and westward of *Nepean Sound* lie the extensive islands forming *Pitt Archipelago* and *Banks Island*, separated from the continent by *Grenville Canal*, and from each other by the *Canal de Principe*; the first so named by *Vancouver*, on his exploration in 1793, and the latter by

North Pacific.

Señor Caamano, who first navigated it. The archipelago was named after the celebrated statesman.

PRINCIPE CHANNEL, between Banks Island and Pitt and McCauley Islands, is about 42 miles long in a general W.N.W. and E.S.E. direction, and from 2 to 7 miles wide. Its South shore is bold, with mountains from 1,200 to 1,700 ft. high over it. *Gale Point* is prominent, bold, and high, and lies 9 miles north-westward of Block Islets. A remarkable bare mountain, 1,250 ft. high, lies close to the shore at 3 miles westward of Gale Point. *Deadman Islet*, small and wooded, lies close off the North extreme of Banks Island, and at 2 miles eastward of it is *End Hill*, an oval-shaped hill 450 ft. high, close to the shore.

The North shore, the southern side of Pitt Island, is much broken, especially about midway, into bays, and the mountains, at about 3 miles from the shore, rise to the height of 1,000 to 3,000 ft. *Wolf Point*, the S.E. entrance point of Principe Channel, is high and conspicuous; *Brodie Rock*, a dangerous sunken rock, lies 1 mile S.W. by W. $\frac{1}{2}$ W. from it. Between Brodie Rock and the shore the ground is foul to 2 miles westward of Wolf Point.

Port Stephens, on the North shore, at about 8 miles from Wolf Point, is 4 cables wide at its entrance, and thence extends N. by E. 6 cables, then N.E. 6 cables, and thence in an easterly direction for 8 cables, terminating in two bays, with a large stream at the head of the southern bay. It was named by Capt. Duncan, in the *Princess Royal*, in 1788. Some islets lie westward of the entrance. To reach the harbour keep about mid-channel, and haul gradually to the eastward as the harbour opens out, and anchor in mid-channel in about 12 fathoms. It is high water, on full and change, at 0^h 30^m; springs rise 18 feet.

Bluff Point, the western entrance point of Port Stephens, terminates in a high white cliff. *Oar Point* lies W.N.W. 6 miles from Bluff Point; westward of it the coast recedes northward, terminating in Mink Trap Bay. *Canoe* and *Green Top Islets*, lying off the entrance of this bay, are both small, and named from their appearance.

Mink Trap Bay, consists of two long narrow creeks, separated by a peninsula; this bay is useless as an anchorage for other than small vessels and boats. At the head of the eastern arm is a village, to which a tribe of Indians resort in summer for salmon fishing.

Anger Island, on the North shore, 9 miles westward of Oar Point, is about 4 miles long and 2 miles broad, with shoals extending 5 to 7 cables from its South and East sides. *Trade* and *Storm Islets* extend from 5 cables to 1 $\frac{1}{2}$ mile from its South and eastern shores.

McCauley Island, on the North shore, is 17 miles long, 9 miles broad, and wooded nearly throughout. Near its centre it rises to the height of 1,160 ft. *Table Hill*, 400 ft. high, lies close to the South shore. Off the S.E. end are *Wheeler* and *Cliff Islets*.

Port Canaveral (of Señor Caamano) lies near the S.E. extreme of McCauley Island. *Dixon Island* lies on the western side of the port, with several rocks and islets lying off its South and eastern sides. *Alarm Rock* is a dangerous sunken rock, lying nearly in mid-channel at the mouth of Port Canaveral, at 2 cables W.N.W. from Squall Point, and 2½ cables from Red Point. *Harbour Bank*, with 6 fathoms over it (probably less), lies 1½ cable eastward of Alarm Rock.

Clown Rock, the outer danger extending S.E. of Dixon Island, dries 3 ft., and lies S.E. by E., 3 cables from Tonkin Point, the South extreme. *Stephen Rock*, 3 ft. about high water, lies 1½ cable from Dixon Island; its outer portion, which uncovers, lies S.E. 2½ cables from Dimple Point, the N.E. extreme of Dixon Island.

Entering Port Canaveral, Dimple Point may be steered for when in line with Stephen Rock, N.W. by W., until Bush Islet, off the S.W. extreme of Dixon Island, is just shut in with Tonkin Point, W.S.W. The latter mark kept on astern will lead to the anchorage ground, in 14 to 15 fathoms, sand, at 1½ cable N.E. of the North entrance point, Red Point. It is high water, on full and change, at 0^h 30^m; springs rise 18 feet.

Petrel Channel, between Pitt and McCauley Islands, was not examined. Its southern entrance is about 3 miles wide, thence the channel runs N.W. for nearly 8 miles, when it divides, one passage running northward, the other southward of Lofty Island, and again joining at 2 miles eastward of Ogden Channel.

Hankin Ledges extend nearly 1 mile off *Hankin Point*, the S.W. extreme of McCauley Island.

The mid-channel course should be kept when navigating Principe Channel, until nearing Anger Island, when the South shore should be neared to avoid the dangers which extend off that island. The tidal streams run 3 knots an hour at springs.

BANKS ISLAND is about 41 miles long W. by N. and E. by S., and from 5 to 10 miles broad. The southern shore is wooded and comparatively low, seldom exceeding the height of 150 ft. This shore is broken into bays and creeks, rendered useless as anchorages by numerous rocks awash, and sunken dangers, extending 2 miles off in some places. *Calamity Bay*, at the S.E. extreme of Banks Island, has iron-bound shores, with rocky islets and sunken dangers occupying the bay nearly throughout. *Breaker Islets* lie off its South side, the highest islet being about 70 ft. high, and wooded.

Terror Point, at the South extreme of Banks Island, is high and bold, 200 ft. above high water. *Terror Rocks*, which break heavily, extend 1 mile south-eastward of it.

Shrub Islet, 80 ft. high, with a conspicuous patch of bush on its summit, lies 3 miles S.W. from Terror Point, and is surrounded by sunken rocks to the distance of 3 cables.

North Danger Rocks, 7 miles S.S.W. of Wreck Point, and $12\frac{1}{2}$ miles westward of Shrub Islet, consist of five bare rocks, 10 ft. above high water, surrounded by rocks, awash and sunken, to the distance of 5 cables. Vessels should keep southward of the line joining Shrub Islet and North Danger Rocks, and not pass between those dangers and Banks Island.

Halibut Rocks consist of two dangerous clusters, covered at high water, each about 5 cables in extent, lying W.N.W. and E.S.E., $1\frac{1}{2}$ mile apart. The centre of the eastern cluster lies E.S.E., 9 miles from the summit of Bonila Island, and S.E. by S., $4\frac{1}{2}$ miles from Cliff Point. *Cliff Point* terminates in high white cliffs.

Bonila Island, 9 miles S.S.E. from the N.W. point of Banks Island, and 4 miles from the shore, is an excellent landmark. It is about 2 miles long, East and West, and 1 mile broad, and near the centre reaches an elevation of 550 ft. The summit is dome-shaped, and during the summer is clothed with purple-tinted heather. Landing may be effected at the head of the southern small bay on the eastern side of the island.

South Rocks, two small clusters awash at high water, lie S.S.E. and N.N.W., 1 mile apart. The southern group lies S.S.E. about $3\frac{1}{2}$ miles from the summit of Bonila Island. **High-water Rocks**, nearly midway between Bonila and Cliff Point, are awash at high water, about 2 cables in extent, at $2\frac{1}{2}$ miles E. $\frac{1}{2}$ S., from the summit of Bonila. **North-west Rocks**, half a mile in extent, lie N.W. by W. 2 miles from the summit of Bonila; the highest is 3 ft. above high water. **North Rocks**, about 5 cables in extent are awash at high water, and lie E.N.E. $1\frac{1}{2}$ mile from the centre of North-west Rocks. **Middle Rocks**, two clusters awash at low water, lie respectively W.N.W. $1\frac{1}{2}$ mile, and N.N.E. 2 miles from the summit of Bonila.

White Rocks lie close to the western extreme of Banks Island; the two largest are about 30 ft. high, bare and conspicuous. They form an excellent landmark. Anchorage for small craft, in fine weather, is stated to exist close northward of White Rocks, at the mouth of a creek.

OGDEN CHANNEL, between Pitt and Porcher Islands, is about 16 miles long, and from 4 cables to $1\frac{1}{2}$ mile wide. It affords the shortest means of communication between Skidegate Inlet, Queen Charlotte Islands, and the inner waters, and runs into the North end of Grenville Channel (p. 537). At its southern end the channel is divided by Spicer Island into two passages. The flood stream comes from the southward, and both flood and ebb streams, in the narrow portions of the channel, attain a velocity of 4 knots an hour at springs.

On Dolphin Island **Nubble Mountain**, with an irregular broken summit, rises to a height of 1,400 ft.; S.E. of it, and close to the shore, lies **False Cone Hill**. Off the S.E. shore of Dolphin Island lie two small islets, and some rocks; **Sentinel Islet**, the eastern islet, lies about a mile off shore, is wooded and about 100 ft. high. On the eastern side of Dolphin Island, **Passage Cone**

Hill rises to the height of 454 ft., and is a useful mark for indicating Schooner Passage.

Spicer Island is of triangular shape, and $2\frac{1}{2}$ miles long, attaining near its centre an elevation of 827 ft. Off its S.W. side, at 5 cables from the shore, are *Christie Islets*, a cluster of islets and rocks. At $1\frac{1}{2}$ mile southward of Spicer Island is *Long Island*, low and wooded, *Channel Islet* lying nearly midway between.

Channel Group lies 1 mile northward of Spicer Island, and half a mile northward of it lie some small islets. *South Twin Islet* is a small wooded islet on the eastern shore, 5 cables from the eastern bare islet of the Channel Group and 1 mile northward of Spicer Island. *North Twin Islet* lies 5 cables N.N.W. of South Twin Islet; the tops of the trees on it are about 130 ft. high. Several islets lie between the Twins and McCauley Island.

Beaver Passage, between McCauley and Spicer Islands, is the wider and better of the two passages leading into Ogden Channel. At its western entrance it is about 5 cables wide, and runs N.E. by N. for about $4\frac{1}{2}$ miles, thence sharply to N.N.W. for $2\frac{1}{2}$ miles. To pass through it keep about mid-channel. *North Rock*, always visible, lies nearly in mid-channel at 5 cables S.E. of Long Island. *Connie Rocks* extend 3 cables from the N.E. extreme of Spicer Island, the outer rock only covering at high water.

Schooner Passage, between Spicer and Dolphin Islands, is barely 2 cables wide in its narrowest part, and is about 3 miles long North and South. *Boys Rock*, a dangerous sunken rock, lies at its southern end, 2 cables from the S.E. extreme of Dolphin Island. Sentinel Island bearing W.N.W. will lead southward; and Passage Cone Hill bearing N. by W. will lead eastward of Boys Rock. The passage lies between this rock and Christie Islets.

To pass through Schooner Passage, when abreast the North end of Spicer Island, pass midway between that island and the Channel Group to the North end of Beaver Passage.

Alpha Bay, on the eastern shore, 4 miles within the North entrance of Ogden Channel, is nearly 1 mile wide, but only 3 cables deep. Near its northern end a deep valley extends inland, and through it flows a fine trout stream. Anchorage may be found in 10 and 11 fathoms, $1\frac{1}{2}$ cable from the shore, with the South entrance point of the stream bearing N.E., distant $2\frac{1}{2}$ cables; and Anchor Mountain, 1,934 ft. high, over the North shore of the bay, N.E. $\frac{1}{2}$ N. It is high water, on full and change, at noon; springs rise 18 to 19 feet.

At 1 mile South of Alpha Bay, there is a remarkable white patch on the rocky eastern shore.

Peninsula Point, the N.W. entrance point of Ogden Channel, is prominent, with a hill near its eastern extreme. Northward of it lies *Oona Bay*.

CHATHAM SOUND is an extensive sheet of water about 38 miles long N.W. by N. and S.E. by S., and from 7 to 14 miles wide. It lies between

the Tsimpsean Peninsula and Stephens and Dundas Islands, its N.W. portion washing the southern shores of Alaska. It communicates with Hecate Strait by three channels, Edye Passage, in the S.W. corner of the sound, being the channel usually taken. The eastern shores of the sound are low, and somewhat indented with small bays, surrounded by reefs. The interior country consists of snowy mountains, and there are several conspicuous mountains near the coast. The shores and islands produce large numbers of pine trees.

There are numerous detached groups of islands, islets, and rocks in the sound, the relative positions of which will be best understood by referring to the charts. The southern portion of the sound is comparatively free from danger, the rocky clusters being of considerable elevation above high water and moderately steep-to. Northward of Metlah-Catlah Bay, however, ledges which uncover at low water extend in many places to the distance of 2 miles from shore. Abreast Port Simpson, two clusters of rocks lie in the fairway of the sound; and being but little elevated above high water, render that portion of the sound dangerous by night or in thick weather. Northward of Metlah-Catlah Bay, during a fog, or if uncertain of the position, the eastern shore should not be approached under 70 fathoms; nor the western shore under 40 fathoms.

Point Hunt, the N.W. point of Malacca Passage (p. 539), is very conspicuous, and forms the North point of Pitt Archipelago. It is in lat. $54^{\circ} 6\frac{1}{2}'$ N., and from it the North shore of Porcher Island takes an irregular direction of S.W. by S. to Point Pearce, the southern point of Refuge Bay, the intermediate space having several rocks off it.

Gull Rocks, about half a mile in extent, the highest being about 30 ft. high, lie W. by N., 3 miles from Hunt Point. *Eltrick Rock*, uncovering 3 ft., lies S.E. by E., $1\frac{1}{2}$ mile from the centre of Gull Rocks. *Havelock Rock*, uncovering 6 ft., lies S.W. $\frac{1}{2}$ W., 1 mile from Hunt Point.

Green Top Islet, 15 ft. high, lies N.W. by W. $\frac{1}{2}$ W., $4\frac{1}{2}$ miles from the western Lawyer Island (p. 539). *Holland Islet*, 10 ft. high, lies E. by N. $\frac{1}{2}$ N., $1\frac{1}{2}$ mile from Green Top Islet, and at $1\frac{1}{2}$ mile N.E. $\frac{1}{2}$ E. of it is *Kitson Islet*, off the mouth of North Skeena Passage. *Kinnahan Islands*, two in number, lie about a mile from the shore, and are about 200 ft. high. The South Island lies $1\frac{1}{2}$ mile N.N.W., from Green Top Island.

Rachel Islands (*Lak-oh-wita*) consist of two islands, about 1 mile in extent, N.W. and S.E., wooded, and about 200 ft. high, lying nearly midway between Tsimpsean Peninsula and Stephen Island. The S.E. island lies N.W., $3\frac{1}{2}$ miles from Gull Rocks; and S.W. by W., $5\frac{1}{2}$ miles from South Kinnahan Island. *Alexandra Patch*, 1 mile in diameter, has depths of 10 to 20 fathoms, over a bottom of mud and sand. The eastern edge lies 1 mile North of Rachel Islands.

Lucy Islands are a group of islands and high-water rocks, the large islands being wooded. They lie nearly in the middle of the sound abreast Metlah-

Catlah Bay, and are about 1 mile in extent East and West. The eastern and largest island is 200 ft. high, and lies N.W. $5\frac{1}{2}$ miles from North Rachel Island. This group is of great use when making Metlah-Catlah during thick weather. A ledge of rocks, which partially uncover, extends from 4 to 9 cables southward of the Lucy Group, the outer rock lying South 9 cables from the eastern island.

TSIMPSEAN PENINSULA separates Skeena River (p. 539) from Work Channel; it is nearly 32 miles long N.W. and S.E., with a greatest breadth of 9 miles.

METLAH-CATLAH BAY is formed between Digby and Tugwell Islands, and has a large Indian village on its North shore. *Tugwell Island* is about $1\frac{1}{2}$ mile long North and South, and 200 ft. high to the tops of the trees; it is fringed by dangerous rocky ground, especially on its S.E. side, and at low water is connected with Mission Point. *Alford Reefs* lie midway between the South end of Tugwell Island and *Cridge Islands*, the latter lying on the S.E. side of the entrance to the bay; these reefs are about 3 cables in extent, the northern rock uncovering 2 ft. at low water. Northward of Cridge Islands the shore of Digby Island is fronted by shoals and rocks.

Devastation Island, half a mile eastward of Tugwell Island, lies near the centre of the bay; it is nearly one-third of a mile long North and South, and 150 ft. high, with two islets close off its South end. From its North end a shoal, partly uncovered at low water, extends 5 cables N.E. towards Pike Island, and southward of this line are several islets. *Carr Islet*, about 60 ft. high, lies 5 cables N. by E. from Devastation Island, and is connected at low water with the spit joining Tugwell Island to *Observation Point*, the latter being in lat. $54^{\circ} 20' 10''$ N., long. $130^{\circ} 27' 30''$ W.

Eastward of Carr Islet the navigable channel becomes much contracted by shoal water on each side, and *Kelp Rock*, a dangerous sunken rock, nearly midway between Observation Point and Shrub Islet on the opposite side, narrows it to barely a cable wide at low water. *Mission Point* lies three-quarters of a mile N.E. by E. $\frac{1}{2}$ E. from Observation Point; *Venn Creek* here extends to E. by S. and has several Indian salmon-fishing stations on its shores.

The village of *Metlah-Catlah* is situated on Mission Point, the population being estimated at over 1,000 in number. There is a mission station here, where the young Indians, most of whom speak English, are taught useful trades. The houses of the mission stand about 100 ft. above high water, and have a picturesque appearance. There is a salmon cannery here.

In entering Metlah-Catlah Bay, Carr Islet just shut in with the West extreme of Devastation Island, bearing N. by E., northerly, will lead between Alford Reefs and the foul ground off Tugwell Island. The flagstaff on Mission Point in line with the West extreme of Pike Island, N. by E., leads eastward of Alford Reefs. Anchorage will be found in 11 to 12 fathoms, mud, 3 cables

off the West side of Devastation Island; with the South extreme in line with the smaller Criddle Island, bearing S.E. by S., and the South extreme of Carr Islet in line with the flagstaff on Mission Point, N.E. $\frac{1}{2}$ N. Small vessels occasionally proceed into Venn Creek and anchor off the village, in 10 to 12 fathoms, but the channel into this anchorage is barely 60 yards wide at low water, and should only be attempted by short vessels of light draught. It is high water at Metlah-Catlah, on full and change, at noon; springs rise 21 ft.

Approaching Metlah-Catlah from the south-eastward, if the Lawyer Group be kept in line with Green Top Island, S.E. by E. $\frac{1}{2}$ E., that mark astern will lead directly to the entrance of Metlah-Catlah Bay. In thick weather, do not shoal to less than 40 fathoms, and Lucy Islands should be cautiously steered for and made, taking care to avoid the reefs on their South side. The large island should be brought to bear S.W. $\frac{1}{2}$ W. astern, and a N.E. $\frac{1}{2}$ E. course should take a vessel to the mouth of Metlah-Catlah Bay. The bank of 10 fathoms and less water extends nearly 1 mile southward of Tugwell Island, and the hand lead, if proceeding slowly, should indicate its position.

DUNCAN BAY, on the North side of Tugwell Island, affords anchorage to vessels desirous of communicating with Metlah-Catlah during the prevalence of south-easterly winds. Its entrance is about $1\frac{1}{2}$ mile wide, and thence it takes an easterly direction for about $1\frac{1}{2}$ mile, terminating in the sandpit which connects Tugwell Island and Observation Point. Shoal water extends 5 cables northward of Tugwell Island, and ledges and sunken rocks extend nearly 7 cables from the North shore of the bay. *Hecate Rock*, with 10 ft. water over it, lies near the head of the bay.

To anchor in Duncan Bay, pass 1 mile north-westward of Tugwell Island and when the South extreme of Gribbell Island is seen just open of Observation Point E. $\frac{1}{2}$ S., that mark should be steered for, and a berth taken up on that bearing, in 8 to 10 fathoms, mud, with the N.W. extreme of Tugwell Island bearing S.W. by W.

Tree Bluff, the South entrance point of Big Bay, lies 5 miles N.W. by N. $\frac{1}{2}$ N. from Ryan Point, the North point of Duncan Bay. The shore between is low and wooded, but at 3 miles back from the coast it rises into high land; the two most conspicuous mountains being *Mission Mountain*, 1,310 ft., and *Deer Mound*, 2,230 ft. high. Immediately southward of Tree Bluff is a wooded hill, close to the shore, 250 ft. high.

Between Metlah-Catlah and Big Bays, dangerous ledges extend off shore in many places to the distance of 2 miles. These ledges uncover at low water, and are steep-to. Abreast Tree Bluff the edge of the bank, which dries at low water, lies $1\frac{1}{2}$ mile from the shore.

Hodgson Reefs are a dangerous cluster of reefs which lie north-westward of Duncan Bay. Their South part, which uncovers at low water, lies N.W., 2 miles from Tugwell Island, and W.N.W., $1\frac{1}{2}$ mile from Ryan Point. From that position, dangerous sunken rocks extend in a N.N.W. direction for

2 miles. The South side of Kinnahan Islands, just showing clear of Tugwell Island, S.E. $\frac{1}{2}$ E., leads westward of Hodgson Reefs; the eastern Lucy Island, if not brought to bear South of S. by E., astern, until Mount Griffin is seen in line with the North end of Burntcliff Island N. by E. $\frac{1}{2}$ E., leads westward of all dangers off Big Bay entrance.

BIG BAY (*Lak-Hou*), is $2\frac{1}{2}$ miles wide at its entrance between Tree Bluff and South Island, and takes an easterly direction for $3\frac{1}{2}$ miles. The head of the bay, named *Salmon River Bight*, into which run several streams, is fronted by a sand-flat, drying 1 mile out at low water. *South Island* is small and wooded, with a sharp summit 50 ft. high. A ledge of sunken rocks extends 5 cables S. $\frac{1}{2}$ W. from South Island, and eastward of it, on the edge of the reefs, lie *Haycock* and *White Cliff Islets*, the latter terminating in high white cliffs. A 3-fathoms bank lies 3 cables S.E. of White Cliff Island. *Shattock Point*, 3 cables E.N.E. of White Cliff Island, is the N.W. point of Salmon River Bight.

Ripple Bank, about 2 cables in extent, has 12 ft. least water over it, sandy bottom, near the eastern end: at about a mile S. by W. $\frac{1}{2}$ W., from South Island. *Escape Reefs* are a dangerous cluster of reefs lying in the mouth of Big Bay. The western reef has 4 ft. water over it, and lies S. $\frac{1}{2}$ W. $1\frac{1}{2}$ mile from South Island. The eastern reef, 5 cables to E.N.E., has 5 ft. water over it. In summer kelp is found in great quantities upon Escape Reefs, and near the head of Big Bay.

Sharp Peak, 2,970 ft. high, on the ridge S.E. of Mount Griffin, in line with the South end of Swallow Island, on the North shore of the bay, bearing E. by N., will lead directly into Big Bay, where anchorage will be found in 11 and 12 fathoms, mud, with Haycock Island in line with the North extreme of South Island, N.W. by W. $\frac{1}{2}$ W., and White Cliff Island in line with Mount Griffin, N. by W. $\frac{1}{2}$ W.

Burntcliff Island, northward of South Island, is about half a mile long, and wooded, rising near its North end to 200 ft. high. Its North extreme terminates in high reddish-brown cliffs; the N.E. extreme is cultivated, and from that point a long bank of shingle, awash at high water, extends 3 cables in a north-easterly direction. The whole space inshore of South and Burntcliff Islands, uncovers at low water. *One Tree Islet*, 4 cables N.W. of Burntcliff Island, has a sharp wooded summit, 150 ft. high, and is surrounded by a ledge, which uncovers.

Flat Top Islands, $3\frac{1}{2}$ cables northward of One Tree Islet, consist of three wooded islands, surrounded by ledges and foul ground to the distance of $1\frac{1}{2}$ cable.

Sparrowhawk Rock, a dangerous sunken pinnacle rock, with 5 ft. water, lies N.W. $\frac{1}{2}$ N., nearly 5 cables from the North extreme of One Tree Islet. H.M.S. *Sparrowhawk* struck on it in 1866. It lies nearly midway between One North Pacific.

Tree and Finlayson Islands, and is steep-to. Leading Peak, the first peak to the S.E. on the ridge from Mount Griffin, just open southward of the wood-cutting establishment abreast Otter Anchorage, E. by N. $\frac{1}{2}$ N., will lead northward of the rock, and southward of *Dodd Rock*, which lies a little over 2 cables South from Fortune Point, with ledges between. *Dodd Rock* only covers at the highest equinoctial tides, and there is deep water a short distance southward of it.

Pearl Harbour, eastward of One Tree Islet, is nearly 5 cables in diameter, and affords good anchorage in 9 to 10 fathoms, mud, near the middle.

Finlayson Island is $2\frac{1}{2}$ miles long N.W. $\frac{1}{2}$ N. and S.E. $\frac{1}{2}$ S., and 1 mile broad, 200 ft. high, and wooded. *Fortune Point*, its South extreme, terminates in cliffs; but *Gordon Point*, the North extreme, is comparatively low, with ledges uncovering 2 cables to the northward.

Red Cliff Point, on the East side of Cunningham Passage, 5 cables N.E. from Fortune Point, is rendered conspicuous by the high cliffs over it, and the small islet close to.

Otter Anchorage, at the South end of Cunningham Passage, near the eastern shore, is useful if communicating with the wood-cutting establishment abreast it. Anchorage in 15 to 17 fathoms, sand, will be found with the centre of the establishment in line with Leading Peak, E. by N. $\frac{1}{2}$ N., and the northernmost Flat Top Island S. by E., distant $1\frac{1}{2}$ cable. The wood-cutting establishment, from which the principal supplies for Port Simpson are obtained, lies near the middle of a sandy bay, which dries nearly throughout at low water.

Cunningham Passage, eastward of Finlayson Island, is barely $3\frac{1}{2}$ cables wide in its southern part, but northward of Sarah Point, the N.E. extreme of Finlayson Island, it widens out. To enter it steer N.E. for Red Cliff Point in line with Fortune Point, until the mark comes on for clearing Sparrowhawk Rock.

PORT SIMPSON is the most spacious harbour on this part of the coast, and has a large area of smooth water anchorage, easy of access at all times of tide. At its entrance, between One Tree Islet and Birnie Island, it is nearly $1\frac{1}{2}$ mile wide; thence it takes an easterly direction for about $3\frac{1}{2}$ miles, contracting gradually as the head is approached, and terminating in a narrow bight, named *Stumaun Bay*, which dries. At its head are several streams, where salmon are caught. *Mount Griffin*, with its triangular summit, 1,410 ft. high, southward of the port, is conspicuous, and on the North shore are two wooded hills, about 870 ft. high, named *George* and *Lizzie*. The mouth of a lagoon, on that shore, is also conspicuous.

The greatest depth in Port Simpson is 29 fathoms, but the average depths near the anchorage ground are from 12 to 18 fathoms, mud. The usual anchorage lies off the fort, in about 10 fathoms; a good berth is with Parkin Islands just open northward of Birnie Island, bearing N.W., westerly. A

sandy patch of 3 fathoms lies off Port Simpson, with the Fort gate bearing S.E. $\frac{1}{2}$ E., and the pole on One Tree Islet, S.W. $1\frac{1}{2}$ cable.

Village Island, at the S.W. entrance of Port Simpson, is about $2\frac{1}{2}$ cables long, and lies about a cable from the shore, with which it is connected at half tide; on its southern extreme is a Tsimpsan village, connected with the shore by a bridge. Near its N.W. extreme is a high pole. The observation spot, on the N.W. extreme, is in lat. $54^{\circ} 33' 51''$ N., long. $130^{\circ} 26' 36''$ W. *One Tree Islet* lies close to the N.W. extreme of Village Island, and near its western end stands (or stood) a conspicuous decayed tree.

Birnie Island, at the N.W. entrance of Port Simpson, is three-quarters of a mile long North and South, and rises to a height of 330 ft. Ledges, which uncover, extend 1 cable from Knox Point, its South extreme. The channel northward of the island is obstructed by ledges.

Hankin Reefs, which partially uncover, lie S.W. of Village Island, their S.W. extreme being distant a little over 3 cables. Fortune Point just shut in with Sarah Point, S. by E. $\frac{1}{2}$ E., leads westward of them. **Harbour Reefs**, an extensive plateau of rocks awash at high water, form a natural breakwater at the mouth of Port Simpson, and protect the anchorage from N.W. winds. It is nearly square in shape, and about 1 mile in extent, the S.E. portion lying W.N.W., $2\frac{1}{2}$ cables from One Tree Islet.

Dodd Passage lies between One Tree Islet and Harbour Reefs, and leads to the anchorage off Fort Simpson; it is 2 cables wide, with depths of 6 and 8 fathoms in it, and is available for steam-vessels, but local knowledge is necessary. The mouth of the lagoon on the North shore of Port Simpson, seen just open westward of One Tree Islet, bearing N.E. $\frac{1}{2}$ N., leads through.

Inskip Passage, the northern and principal entrance into Port Simpson, lies between Birnie Island and Harbour Reefs, and is a little over 5 cables wide, with depths of 11 to 20 fathoms. In approaching from the Cunningham Passage, Sarah Point in line with the South point of a bay on the eastern shore bearing S.E. $\frac{1}{2}$ E., astern, will lead midway between Harbour Reefs and Finlayson Island.

Lizzie Hill, bearing N.E., will lead through the centre of Inskip Passage, until Parkin Island is seen just open northward of Birnie Island, bearing N.W., westerly, which mark kept on astern will lead up to the anchorage.

FORT SIMPSON was originally formed by the Hudson Bay Company at the mouth of Nass River, but in 1831 the trading post was removed hither, on account of the good anchorage found in the vicinity and the facilities afforded to sailing vessels. It stands near the S.W. entrance point of the bay, close to the beach, and when seen from seaward presents a strong and compact appearance. A large entry gate faces the beach, with a landing jetty of stones in front of it. Excellent potatoes, lettuces, and radishes are grown, also raspberries and strawberries in abundance. The climate is very uncertain. The Company's trading steam-vessel calls periodically at Port Simpson, bringing

supplies and returning with the furs. Wood, water, potatoes, and crabs, can be obtained in Port Simpson.

Before the fort was built, the villages of the Tsimpsean Indians were at Metlah-Catlah, but the tribe being great traders, as well as hunters, they migrated nearer the trading post, and settled along the beach on either side of the fort, and upon Village Island. In front of the houses high poles are erected, with grotesque carvings on them. In 1868 the Indians numbered about 2,000; in 1884 they were stated to number only about 800. There is a Methodist mission here.

The language of trading, and for communication generally between tribes speaking different dialects, is called Chinook. This jargon consists of English, French, and Indian words strung together, with no grammatical basis. It is readily acquired, and almost universally spoken by the coast tribes from the Columbia River to Alaska.

The great rise and fall of tide here permits a vessel to be beached; a good site will be found for this purpose just westward of the fort, the bottom consisting of hard sand, with a covering of weeds.

Tides.—It is high water at Port Simpson, on full and change, at 1^h 30^m; springs rise 17 to 22 ft., neaps 14 to 17 feet.

For swinging to ascertain the deviation of the compass, the bearing of the knob at the North end of Table Hill on Dundas Island, from the anchorage in Port Simpson, is N. 76° 00' W. (*true*), distant 12 miles.

Parkin Islands, about 1½ mile N.W. ¼ N. from Birnie Island, are about a cable in extent N.W. and S.E., and though small, are 250 ft. high, wooded and conspicuous. Codfish, of large size, are caught on a bank of 33 fathoms, between these islands and Pointers Rocks.

Maskelyne Point, the S.E. entrance point of Portland Inlet, was so named after the astronomer; it lies 1½ mile N. ¼ E. of Parkin Islands, and S.E. ¼ S. 3 miles from Wales Point, the N.W. point of Portland Inlet entrance.

Work or Wark Channel.—Immediately northward of Point Maskelyne is the narrow entrance to this branch, which takes a general E. by S. ¼ S. direction for 32 miles, its head approaching the N.E. part of Skeena River entrance, thus forming the land into a peninsula. Its S.W. shores are nearly straight and compact; its general width from 1½ to 2 miles, excepting near the entrance, where it has a breadth of about 4 cables for a distance of 7 miles. Here the tide runs at the rate of about 4 knots. An arm diverges from its N.E. shore, at 23 miles within the entrance, and trends in a general N.E. direction, but is made into a tortuous channel by a remarkably steep, rocky precipice, which at high water becomes an island. It had formerly been appropriated to the residence of a very numerous tribe of Indians. Wark Channel has not been closely examined.

PRESCOTT and STEPHEN ISLANDS lie in the S.W. part of Chatham Sound, with a boat passage between them. Together they are about 12 miles

long W. by N. and E. by S., of triangular shape. Prescott Island is 820 ft. high; Stephen Island attains an elevation of 1,340 ft. near its East end, but its southern shores are comparatively low, with some white cliffs near the centre.

Tree-nob Groups are an extensive labyrinth of islands, islets, and rocks awash at low water, which extend 6 miles in a north-westerly direction from the N.W. side of Stephen Island. The larger islets are wooded, and Vancouver describes them as "an intricate inhospitable labyrinth." *Butterworth Rocks* are a dangerous cluster, the southernmost 10 ft. high, with several patches which uncover extending three-quarters of a mile north-westward of it. This rock lies $3\frac{1}{2}$ miles S.W. by S. $\frac{1}{2}$ S. from the S.W. island of the Tree-nob Group.

EDYE PASSAGE, on the South side of Prescott and Stephen Islands, is the channel usually taken between Chatham Sound and Hecate Strait. It is comparatively free from danger, and at its northern end is Refuge Bay, an excellent anchorage. The flood approaches from the westward, and both streams set through the passage, at an average rate of 2 knots an hour.

Goschen Island, on the South side of the western entrance of Edey Passage, is separated from Porcher Island by *Canoe Passage*, which was not examined. *Cape George*, in lat. $53^{\circ} 51' N.$, is its S.W. point, and for 5 miles northward of this the coast is fronted by a rocky ledge of 4 to 8 fathoms, extending nearly 4 miles off, with several rocks, awash and sunken, within a mile of the shore. *Oval Hill*, 630 ft. high, near the West extreme of the island, is conspicuous, and 2 miles northward of it is a flat-topped hill, 170 ft. high.

Seal Rocks, a small cluster 10 ft. high, lie 6 miles W.N.W. of Oval Hill, and 4 miles S.W. by S. $\frac{1}{2}$ S. from Cape Ibbetson. *Warrior Rocks*, 30 ft. high, are two bare rocks 8 cables apart, E. by S. and W. by N., the eastern rock lying $3\frac{1}{2}$ miles N.W. $\frac{1}{2}$ W. from Seal Rocks.

Cape Ibbetson, the southern entrance point of Edey Passage, and the N.W. point of Pitt Archipelago, is a very conspicuous projecting land. It is the North point of William Island, to the eastward of which is Henry Island. Arthur Island lies on the opposite side of the passage, off the southern side of Prescott Island. *Truscott Patch*, with 16 ft. water upon it, lies $1\frac{1}{2}$ mile E.N.E. from Cape Ibbetson, and 6 cables off Henry Island. Foul ground extends 3 cables off the S.E. side of Arthur Island.

Directions.—Approaching Edey Passage from the southward, to clear the ledges off Goschen Island, the eastern portion of the high white cliffs on the South side of Stephen Island should not be brought to bear westward of North until Oval Hill is seen in line with Seal Rocks, S.E. by E. $\frac{1}{2}$ E. Thence steer N.E. $\frac{1}{2}$ N. until the South and S.E. points of Arthur Island are in line, which may then be steered for, bearing E. by N. $\frac{1}{2}$ N. Pass half a mile southward of the South extreme of Arthur Island, and when the entrance points of Refuge Bay are seen in line, steer for them, bearing N.E. by N., taking care to avoid the small patch which uncovers at low water, 8 cables off

the South point of Useless Bay. Pass 2 to 3 cables westward of Pearce Point, the South entrance point of Refuge Bay, and to enter Chatham Sound a N.W. by N. course should then be steered towards Rachel Islands, passing midway between that group and Gull Rocks.

Refuge Bay, at the N.W. extreme of Porcher Island, is an excellent stopping-place during south-easterly winds, and here the state of the weather in Hecate Strait can be ascertained. The entrance is 7 cables wide, and it thence takes a south-easterly direction for about a mile, terminating in a sand-flat which extends nearly 5 cables from its head. Anchorage will be found in 12 to 14 fathoms, sand and mud, near the middle of the bay, with *Table Point*, the North entrance point, bearing N.N.W., and Pearce Point, W. by S. $\frac{1}{2}$ S.

It is high water in Refuge Bay, on full and change, at 1^h 30^m; springs rise 17 to 22 ft., neaps 14 to 17 feet.

Brown Passage, between Tree-nob Islands and South Dundas Island, is about 5 miles long and 5 miles wide. Nearly in mid-channel, however, lie Hammer Rocks, dividing it into two channels. This passage is not recommended to strangers; the tides off the entrance are strong and irregular.

Stenhouse Shoal has only about 7 ft. water on it, and is reported to cover an area of about 2,500 square yards; it lies off the entrance at 6 $\frac{1}{2}$ miles S.W. by W. from the South extreme of South Dundas Island, and W. by N., 5 miles from the outer Osborne Island. *North Breaker* is the N.W. known danger extending from the Tree-nob Group, and lies W.N.W. 1 mile from the outer Osborne Island.

Hammer Rock is awash at high water, with several patches, which uncover, extending three-quarters of a mile W.N.W. It lies nearly in mid-channel, N. by E. 2 $\frac{1}{2}$ miles from the outer Osborne Island, S. by W. 2 $\frac{1}{2}$ miles from Cape Islet, and E. by N. 5 $\frac{1}{2}$ miles from Stenhouse Shoal. Lucy Island bearing E.N.E. leads South of it, and bearing E. $\frac{1}{2}$ N., North of it.

Simpson Rock lies on the North side of Brown Passage S. by W., three-quarters of a mile from Cape Islet; it is 6 ft. high, with rocks awash extending half a mile westward, and a patch which uncovers 3 ft. at 3 cables S.E. of it. *Beaver Rock*, with 12 ft. water on it, lies S.S.E. 1 $\frac{1}{2}$ mile from the S.E. extreme of South Dundas Island. Several patches of rock lie between it and the shore.

Clawdreeet Anchorage lies on the N.W. side of Stephens Island, and here Vancouver stayed in company with three ships in search of furs, &c., under the command of Mr. Brown. Its entrance is three-quarters of a mile wide, and thence it extends 1 mile in a southerly direction. *Entrance Reef*, awash at high water, lies 2 cables N.W. of the eastern entrance point. The North end of Tugwell Island in line, astern, with the eastern Lucy Island N.E. by N. $\frac{1}{2}$ N., will lead to the entrance, when keep in mid-channel, and anchor 3 cables within the bay and 1 $\frac{1}{2}$ cable off the South shore, in 12 to 14 fathoms, mud,

It is high water, on full and change, at 1^h 30^m; springs rise 17 to 22 ft., neaps 14 to 17 feet.

DUNDAS ISLANDS, so named by Vancouver, are three in number, the northernmost being the largest and highest. Their western shores have not been thoroughly examined.

South Dundas Island is about 3 miles long N.W. and S.E., and 5 miles broad. The shores are comparatively low, and wooded, but near the middle a mountain range rises to the height of 1,400 ft., with four conspicuous peaks which lie in a N.E. and S.W. direction. *Middle Dundas Island* lies about 2 miles north-westward, the passage between being obstructed by numerous islets and rocks. It is nearly 5 miles long N.W. and S.E., and in general is low and wooded, but near the southern end the land suddenly rises in an oval-shaped hill, *Coast Mound*, 750 ft. high, a useful landmark. *Connel Islands* are a group of small wooded islands off the western side of Middle Dundas Island. The outer island lies about 2 miles from the shore.

North Dundas Island is about 12 miles long North and South, and about 7 miles broad near its North end. At 4 miles from its South end is *Thumb Peak*, 2,500 ft. high. Near the North end is *Table Hill*, 700 ft. high, with a flat top, and a knob near its North end, a most conspicuous and useful mark.

Zayas Island, the largest of the islands off the western shore of North Dundas Island, appeared to be about 4 miles long North and South, is wooded, and about 250 ft. high. A ledge of rocks was observed to extend nearly a mile from the N.W. extreme, and from the West side rocks are said to extend 3 miles. There is a good channel between Dundas and Zayas Islands, frequently used by steamers.

Channel Islands, about 100 ft. high, extend across the channel between Middle and North Dundas Islands, rendering that channel useless for any but the smallest class of sailing vessels. *Moffat Islands*, lying close to the eastern shore of Dundas Islands, extend over a distance of 6 miles N.W. and S.E., the highest being about 250 ft. in height. They show out well, being clothed with a peculiar deep green pine tree.

Ducie Island, a small wooded islet, 350 ft. high, lies 1 mile N.W. of the Moffat Group; two conspicuous white rocks, 30 ft. high, lie 3 cables westward of it. *Whitesand Islet*, about 10 ft. high, lies 6 cables N.E. by E. from Ducie Island; a ledge of rocks, which uncover, extends 4 cables N.W. and S.E. of it.

Hammond Rock, with 9 ft. water over it, lies 9 cables E.N.E. from the S.E. extreme of the S.E. Moffat Island. *Coghlan Rock*, with 3 ft. water, and 6 and 7 fathoms close around, lies 2 miles N.W. of Hammond Rock. *Brodie Rock*, 3½ miles N.W. of Coghlan Rock, is a dangerous pinnacle with only 3 ft. over it at low water. Rachel Islands open northward of the Lucy Group, bearing S.E. ½ S., will lead northward of the above-mentioned dangers; but in

thick weather, the western shore of Chatham Sound must not be approached under the depth of 40 fathoms.

Pointers Rocks lie at the North end of Chatham Sound, and are a dangerous cluster of bare rocks, 3 ft. above high water, about 2 cables in extent North and South. The southernmost and highest rock lies N.N.W., 3 miles from the North extreme of Finlayson Island; and W.S.W., $2\frac{1}{2}$ miles from the North extreme of Birnie Island.

Connis Rocks lie nearly in the middle of Chatham Sound, abreast Port Simpson. The southernmost and highest rock is 15 ft. high, and from it rocks extend 2 cables in a northerly direction. It lies W.S.W. $5\frac{1}{2}$ miles from the North extreme of Finlayson Island, and S.W. by S. $3\frac{1}{2}$ miles from Pointers Rocks. Vancouver remarks:—"These in the daytime and clear weather are easily avoided; but in dark nights, or foggy weather, they must render the navigation of the sound very dangerous."

Green Islet, 3 miles S.W. by W. of Connis Rocks, and about $1\frac{1}{2}$ mile off the East side of North Dundas Island, is 40 ft. high, and has a small rock lying close northward, and another close southward of it. **Grey Islet**, 30 ft. high, lies 9 cables North of Green Islet; a rock with 6 ft. over it lies 1 mile W.N.W. of it, and another of 4 ft. at 3 cables South of it.

Main Passage, between Pointers and Connis Rocks, is $3\frac{1}{2}$ miles wide. **Oriflamme Passage**, between Connis Rocks and Green and Grey Islets, is 3 miles wide. The passage between Dundas Island and Green and Grey Islets, is nearly $1\frac{1}{2}$ mile wide, but the tides in it are strong; and the channel is not recommended to a stranger.

Gnarled Islands, about 1 mile in extent East and West, lie off the N.W. side of North Dundas Island; they are from 150 to 250 ft. in height, the eastern islet lying W. $\frac{1}{2}$ N. $2\frac{1}{2}$ miles from the N.E. extreme of the Dundas Group, but the channel between is stated to be obstructed by ledges and sunken rocks. **White Rocks**, about 30 ft. high, lie half a mile from the N.W. extreme of North Dundas Island.

DIXON ENTRANCE is the channel passing northward of Dundas Islands, and between Prince of Wales and Queen Charlotte Islands. Several sunken dangers are reported to lie on or near a line joining the North end of the Dundas Group and the South end of the Prince of Wales Group.

Cape Fox, so named by Vancouver, is about 8 miles northward of the Gnarled Island Group, and terminates in remarkable high, white cliffs; with a conspicuous saddle-shaped mountain, 1,800 ft. high, immediately over it. **Lord Islands**, about a mile extent, 3 miles S.E. of Cape Fox, are wooded, and about 250 ft. high. A ledge, which uncovers 3 ft. at low water, lies 8 cables S.W. by S. from the S.W. island.

Tongas Island lies about 3 miles eastward of Cape Fox; **Nakat Inlet**, the channel between, was not examined, but it extends in a northerly direction, terminating in a stream in about lat. $54^{\circ} 56' N.$, long. $130^{\circ} 40' W.$ There is

a military post of the United States here, but the approaches to the settlement are intricate and require local knowledge; the anchorage abreast the fort is bad, with deep water and limited accommodation even for a vessel of moderate length.

Boston Islands, lying off Wales Island, at the S.E. approach to Tongas, are about a mile in extent East and West. The larger islands are wooded, the western island being 450 ft. high, and conspicuous. A ledge, which uncovers, lies 1 mile E. by S. from Boston Islands, and 1 mile off Wales Island.

Wales Island, on the N.W. side of the entrance to Portland Inlet, is about 7 miles long East and West. The N.E. shore is bold, with some conspicuous reddish-brown cliffs nearly midway between the North and South extremes. On the South side, about 1 mile westward of Wales Point, a deep bay faces south-eastward, having some rocks within it, and a wooded islet at the mouth, $1\frac{1}{2}$ mile S.W. $\frac{1}{2}$ W. from Wales Point, having a smaller one 1 mile south-westward of it. *Entry Peak*, about half a mile N.W. of Wales Point, is 1,400 ft. high, with a sharp conspicuous summit; and near the middle of Wales Island is a mountain, with a flat summit, 1,100 ft. high.

Tides.—The tides in Dixon Entrance and Brown Passage, especially in their western parts, are variable and complicated. The flood stream approaching from the southward is met by the stream passing northward of Queen Charlotte Islands, at about midway between the N.E. extreme of the latter and the Tree-nob Group. Northward of that position this meeting of the streams produces tidal irregularities, and at spring tides, or during bad weather, the turmoil caused by the meeting of the streams is very great. In Chatham Sound the tides set fairly through.

A strong current sets out of Portland Inlet and Wark Channel into Chatham Sound, and sweeps past the Pointers, and then flows out through Dixon Entrance. The current is about $2\frac{1}{2}$ miles per hour.—*Captain J. C. Brundige*.

PORTLAND INLET extends N. by E. $\frac{1}{2}$ E. from the N.E. part of Chatham Sound for 10 miles, thence N. by E. for 10 miles, where it divides, Observatory Inlet continuing northward, and Portland Canal taking a N.W. and northerly direction. It is from $2\frac{1}{2}$ to 4 miles wide, and the shores are high and bold, especially the eastern. *Needle Peak*, on the S.E. side of Naasoga Gulf, is a sharp snow-clad pinnacle, 5,000 ft. high. The entrance, between Wales and Maskelyne Points, is about 3 miles wide.

Point Wales is situated opposite the entrance of Wark Inlet, and would appear, from the chart, to be only about $3\frac{1}{2}$ miles distant, while in reality it is little, if anything, short of 8 miles distant.—*Mr. H. J. Cambie* (Engineer in charge of Railway Surveys in 1879).

Compton Island, on the East side of Work Channel entrance, is 2 miles long, terminating in a long, low point, at its northern extreme. *Emma Passage*, *North Pacific*.

eastward of it, is 5 cables wide, and runs E.S.E. for 3 miles to Union Bay, and thence N.N.E. 3 miles, terminating in a sandy bay. *Union Bay* affords anchorage for small vessels in 20 fathoms.

Somerville Island, 2,000 ft. high, on the eastern side of the inlet, is $8\frac{1}{2}$ miles long N. by E. and S. by W., and 3 miles broad. The shores are wooded and bold. *Elliott Point*, its South extreme, lies N. by E. 4 miles from *Maskelyne Point*. *Truro Island*, 2 cables off the S.W. side of *Somerville Island*, is about $1\frac{1}{2}$ mile long, wooded, with bold shores, and rising to two hills 800 ft. high. Vancouver found anchorage off a small bay on its West side in 35 fathoms, soft bottom. *Nob Islet*, 30 ft. high, lies close to the shore at 8 cables from the North end of *Truro Island*. There is a remarkable white cliff just southward of it. *Start Point*, the North extreme of *Somerville Island*, is high and bold, with a deep bay close eastward of it.

Steamer Passage, eastward of *Somerville Island*, is about 5 cables wide, with deep water. *Khutzymateen Inlet*, 5 miles within the entrance, was not examined. *Quinamass Bay*, on the eastern side of the North end of the passage, is nearly filled up with a sand-flat, rendering the bay useless as an anchorage.

Nasoga Gulf, eastward of *Mylor Peninsula*, extends in a north-easterly direction for 5 miles, and is 1 mile wide. Anchorage will be found 2 cables from the head, in 10 to 12 fathoms, sand, in mid-channel. *Mylor Peninsula* is $9\frac{1}{2}$ miles long N. by E. and S. by W., with an average breadth of 2 miles. *Trefusis Point*, the South extreme, terminates in high white cliffs, and 3 cables off it is the bare *Ranger Islet*. The North extreme terminates in *Low Point*, low and wooded, the southern entrance point of *Nass Bay*.

Pearse Island, forms the western side of *Portland Inlet*. *York Islet*, 5 cables N.E. of the North extreme of *Wales Island* (p. 561), on the West side of *Portland Inlet*, is wooded, and 100 ft. high. Abreast it an intricate channel leads westward to *Tongas Passage*. *Cliff Point*, lies N. $\frac{3}{4}$ E., 7 miles from *Wales Point*, and about $3\frac{1}{2}$ miles from *York Islet*, terminating in high cliffs, with a narrow creek southward of it. *Lizard Point*, 3 miles N.N.E. of *Cliff Point*, has sandy bays close North and South of it, and when seen from the westward, makes as an island. At $2\frac{1}{2}$ miles northward of *Lizard Point* are some conspicuous red-brown earthy cliffs. *Portland Point*, about 18 miles within the inlet, lies $8\frac{1}{2}$ miles North of *Lizard Point*; it forms the turning point into *Portland Canal*, and is high and bold.

Ramsden Point, which divides *Observatory Inlet* from *Portland Canal*, lies $2\frac{1}{2}$ miles N.N.E. of *Portland Point*, and has a dangerous cluster of rocks, awash and sunken, extending 4 cables S.E. of it. At half a mile eastward of *Low Point*, is *Landship Mountain*, 2,040 ft. high, with a bare side facing the N.W.

NASS BAY, northward of *Mylor Peninsula*, is 2 miles wide at the entrance, and preserves this width in an easterly direction for 3 miles, and then

divides, one branch running in a N.E. direction to the mouth of Nass River, the other to the S.W., forming Iceberg Bay. An extensive sand-flat occupies nearly the whole of the eastern portion of the bay. *North Point*, the North entrance point, terminates in a bold cliff; at 1 mile eastward of it is *Mission Valley* extending to the northward, on the western side of which *Mount Tomlinson*, 3,385. ft. high, will be seen. A large stream runs through the valley, and on the East side of its mouth stands *Kincolith Mission Station*, in lat. $54^{\circ} 59' 26''$ N., long. $129^{\circ} 57' 36''$ W. *Fort Point*, the N.W. entrance point of Nass River, terminates in white cliffs; and on the eastern side of the bay, *Mud Islands*, low and dark, will be seen, the northern one 145 ft. high, and the other 106 ft. high.

Canoe Flat, an extensive sand-flat, commences at *Fort Point*, and taking a S.W. direction, forms a triangle, the apex of which lies 6 cables off shore, S.E. of the mission station; thence it takes a N.W. direction to the shore half a mile westward of *Kincolith*. This flat renders communication with *Kincolith* by boat, except at high water, almost impossible. The western portion of *Nass Bay* is deep.

Anchorage, in fine weather, will be found off *Kincolith*, nearly in the middle of *Nass Bay*, on the line joining the mission station and *Landslip Mountain*, in 10 fathoms, mud, about 8 cables from the North shore; with the mission flagstaff in line with the centre of *Mission Valley*, bearing N. by E. A strong ebb tide will be felt in this position, and *Canoe Flat* being very steep-to, it is recommended to use the deep-sea lead in approaching it.

It is high water at *Nass Bay*, on full and change, at $1^h 5^m$; springs rise 17 to 23 feet.

Iceberg Bay extends 3 miles to S.S.W., and is not less than 7 cables wide, but the entrance is narrowed by the shoal extending from *Nass River* to within $2\frac{1}{2}$ cables of *Double Island Point*, the West entrance point. Here the depth of 10 fathoms, and less, will be found; but it deepens to over 40 fathoms towards the head of the bay. Anchorage may be obtained at the entrance in 7 to 8 fathoms, mud, with *North Point* in line with *Double Islet Point*, bearing N.W. by W. $\frac{1}{4}$ W., 3 cables from the latter.

Nass River flows into the N.E. corner of *Nass Bay*, but the entrance is obstructed by a bar with only 9 ft. on it at low water. From its mouth a sand-flat, dry at low water, extends towards the mouth of *Iceberg Bay*. Within the river, the navigation is difficult and dangerous; it has been ascended by a steamer more than 25 miles, and is used by small coasters at half flood, the channel at low water being barely available for large canoes. In severe winters it is reported to freeze over, down to its mouth. Its muddy water may be distinguished flowing down *Portland Inlet*. It is believed that the region it waters is rich in gold. At its entrance, abreast *Fort Point*, the river is $1\frac{1}{2}$ mile wide; thence it runs E.N.E. for 7 miles; and N.N.E. for 7 miles, to abreast the *Nass villages*. It continues in a N.E. direction for 25 miles

beyond the lower Nass villages, and there divides. *Kilawalaks* village, 'the head of canoe navigation, is situated on the N.W. branch, 40 miles from the lower Nass villages.

The lower Nass villages are three in number, the population being about 500 in 1868. The Hudson Bay Company's trading store lies on the western shore, about 1 mile below the middle village. The Houlikan, Oulachan, or Candle fish, from which a nutritious oil is obtained, the principal sustenance of the Indians, is caught in the river in great numbers during the spring.

Two salmon canneries, a saw-mill, store, two missionary stations, and several Indian villages are situated along the stream. The climate is favourable to the growth of fruit, cereals, and root crops near the coast.—*The West Shore.*

OBSERVATORY INLET (*Kit-Sah-Wall*), northward of Nass Bay, is generally speaking similar to the other inlets. At its entrance it is $1\frac{1}{2}$ mile wide, and thence runs in a general northerly direction for about 12 miles, thence N. by W. for 4 miles, and widens to 3 miles abreast Salmon Cove.

Salmon Cove is 20 miles above Point Ramsden, and on the western shore of Observatory Inlet. It affords good anchorage, but in deep water, and every convenience. Here Vancouver's vessel remained for some time, in July, 1793; and here he placed his observatory, from which circumstance the name of the inlet is derived. A very great abundance of salmon were taken here, up a very fine run of fresh water flowing into the cove; but they were small, insipid, of a very inferior kind, partaking in no degree of the flavour of European salmon. A sand-flat extends 2 cables off the mouth of the cove.

The latitude of the observatory was deduced as $55^{\circ} 15' 34''$, long. (corrected) $129^{\circ} 52' 30''$. High water at $1^h 8^m$ after the moon passes the meridian, and the tide generally rose about 6 feet.

Richard Point, the North point of Salmon Cove, is a long wooded projection, northward of which the inlet widens to 4 miles, but is obstructed at 5 or 6 miles distant by several islands and rocks. *Brooke Island*, $2\frac{1}{4}$ miles long, is low, narrow, and wooded. Its South extreme lies 4 miles northward of Richard Point. Several patches of rock, which uncover, extend 5 cables northward of the island. *Paddy Passage*, eastward of Brooke Island, is 5 cables wide, but near its northern end the navigable channel is barely 2 cables wide.

Frank Point, 5 miles N. by W. of Richard Point, and $1\frac{1}{2}$ mile from the western shore of Brooke Island, is low and wooded; northward of it the western shores are much broken, with several deep bays, in one of which, at 4 miles northward of the point, is the *Xschwan* salmon fishery.

Larcom Island, at the mouth of Hastings Arm, is about 5 miles long, with an average breadth of 5 cables; its South extreme lies 6 cables north-westward of Brooke Island. The island is flat, wooded, and comparatively low, and at its S.W. end is an extensive lagoon. The channel westward of the North end

of Larcom Island, is obstructed by ialets and rocks, and is only available for boats.

Hastings Arm extends about 15 miles N.W. $\frac{1}{2}$ N. from the S.E. end of Larcom Island, and is from 5 to 10 cables wide. The water is deep, with no known anchorage ground.

Alice Arm, the eastern branch of Observatory Inlet runs in a northerly direction 3 miles, N.E. 3 miles, E. by N. 4 miles, and N. by E. 3 miles, terminating in the usual wooded swamp, with a large stream flowing through it. Its entrance is obstructed by *Little Island*, a small wooded island, which divides it into two channels 3 cables wide. The arm varies in width from 5 cables to 2 miles, the latter being at the head. *Perry Bay*, on the eastern shore of the entrance, is $2\frac{1}{2}$ cables wide, and extends nearly a mile southward, with depths of 14 and 18 fathoms, mud bottom, in mid-channel. Off its western entrance point lies *Sophy Islet*, and at the head of the bay is the *Muckshwanne* salmon fishery.

PORTLAND CANAL (so named from the noble family of Bentinck) diverges from Point Ramsden, in a N.W. direction, for about 6 miles; thence it trends North 13 miles farther, and from thence to its head the bearing is N.W. by N. 42 miles, the canal trending westward of this line. It terminates in low marshy land, in lat. $55^{\circ} 56'$, 80 miles from its entrance in Chatham Sound. The shores of this inlet are nearly straight, and from 1 to $1\frac{1}{2}$ mile apart, composed mostly of high rocky cliffs, covered with pine and cedar trees to a considerable height; but the interior country is a compact body of high barren mountains, covered with snow. The water is deep, and the anchorages few and indifferent. As the surveying party ascended, salmon in abundance were leaping in all directions.

Portland Canal is the boundary between the British possessions and the Alaska territory of the United States; it is only frequented by the Hudson's Bay Company's officers in their steam-vessel for the purposes of occasional trade with the natives. The continental shore to the northward belonged to Russia, and was ceded, by purchase, to the United States in 1867, as detailed in the next chapter.

Ramsden Point is described on p. 562. *Dogfish Bay*, on the eastern shore, about $3\frac{1}{2}$ miles from the point, is occupied by a sand-flat, and is useless as an anchorage. The Indians catch large halibut off this bay. *Tree Point*, on the western shore, $4\frac{1}{2}$ miles from Portland Point, the South entrance point, is low and wooded. A reef extends 5 cables northward of it.

Tree Point is the North extreme of Pearse Island, and westward of it is the entrance of a channel leading to Tongas Passage. This channel runs parallel with the direction of the main inlet, and gradually decreases in width south-westward, continuing 13 miles from its N.E. entrance to an opening to the S.E. into the main channel. Pursuing the same direction, it enters much broken land, intersected by arms, forming an island about 10 miles in circuit,

to the N.E. of which is an arm running in a N.E. direction, ending in low, steep, rocky shores.

Spit Point, on the eastern shore, is the turning point into the northern reach. Between it and Dogfish Bay several small wooded islets lie close to the shore, and a tongue of sand, which uncovers, extends 3 cables S.W. of the point. *Reef Island* lies on the western shore, $1\frac{1}{2}$ mile W.S.W. of Spit Point; a reef extends 2 cables S.E. of it. Two small bays lie under Reef Island, in which a boat may find shelter.

Leading Point is a high, bold point, on the western shore, lying North, $2\frac{1}{2}$ miles from Reef Island. A ledge of rocks, which uncover, extends 2 cables from *Dickens Point*, which lies on the eastern shore, 4 cables from Spit Point. *Sandfly Bay*, on the western shore, abreast Dickens Point, is nearly occupied by a sand-flat, and is therefore useless as an anchorage. *Stopford Point*, bold and conspicuous, lies on the eastern shore, $3\frac{1}{2}$ miles from Dickens Point.

Halibut Bay, on the western shore, 4 miles from Sandfly Bay, is 5 cables wide, and extends $1\frac{1}{2}$ mile to N.W. by W. to an extensive swamp, through which three large streams flow. Off the South point lie a cluster of black rocky islets. The only known anchorage in Portland Canal will be found in Halibut Bay, in mid-channel, 3 cables within the entrance, in 6 to 10 fathoms, mud. *Cross Islet*, a small wooded islet, connected with the shore, lies close northward of Halibut Bay; a rude wooden cross was found on it.

Logan Point lies on the eastern shore, $3\frac{1}{2}$ miles from Stopford Point; a conspicuous saddle-shaped mountain, 4,800 ft. high, lies 3 miles S.E. of it. *Camp Point*, on the western shore, is wooded, bold, and precipitous; the channel here turns to W.N.W.

Centre Island, nearly in mid-channel, abreast Camp Point, is 400 yards long North and South, with some stunted brush upon it, and has a ledge of rocks extending 2 cables northward of it. It is recommended to use the channel westward of the island. A large stream flows through *Barclay Valley*, abreast Centre Island. Salmon Cove, in Observatory Inlet, is here about 4 miles distant.

Three conspicuous landslips are seen on the mountains South of *Landslip Point*, on the eastern shore, 2 miles northward of Centre Island. *Bluff Point*, on the eastern shore, 2 miles from Landslip Point, terminates in a high, bold bluff. *Breezy Point*, on the western shore, $3\frac{1}{2}$ miles from Camp Point, is conspicuous.

Tombstone Bay, on the western shore, 3 miles N.W. by N. from Breezy Point, is 3 cables wide at its entrance, and occupied by a sand-flat. It extends 1 mile to the mouth of a river, in which trout is plentiful. On the North side of the valley, *Dome Peak*, with a snow-clad summit, rises to the height of 6,500 ft. Berries are found in abundance. The bay was named from a rude tombstone being found near the remains of one of the occupants of a village, which once existed here.

Maple Point, on the eastern shore, 3 miles from Bluff Point, is named from the trees upon it. Northward of the point is a large stream, fronted by a sand-flat. *Swamp Point*, through which a river flows, lies 3 miles N.W. $\frac{1}{2}$ W. from Maple Point, and has a sandspit extending 5 cables southward of it. *Pirie Point*, 2 miles N.W. by W. from Swamp Point, is high, bold, and conspicuous.

Bay Islet, on the eastern shore, 7 miles from Pirie Point, is wooded, and connected with the shore. In August, 1868, the temperature of the surface water here was 33°, and it was fresh. *Green Islets*, two small wooded islets, on the eastern shore, lie 2 miles from Bay Islet. Close northward of them a large stream enters the canal. *Slab Point*, on the opposite side, terminates in a high, smooth, slate-coloured cliff.

Blue Point, on the eastern shore, 5 $\frac{1}{2}$ miles from Green Islets, terminates in high, bold cliffs, of a purple blue colour. Two large streams flow through the valley South of it, with a sandspit extending 2 cables off their mouths. *Cliff Point*, on the opposite side, terminates in high white cliffs. *Verdure Point*, 4 miles N.W. by N. from Cliff Point, is conspicuous when the maples on it are in leaf. Midway between Cliff and Verdure Points is a large stream. *Landslip Point*, 1 mile N.W. by N. from Verdure Point, has a high landslip over it.

Round Point, 6 miles from Blue Point, is the turning point, on the eastern shore, into the northern reach of Portland Canal. *Seal Rocks*, 2 cables off the western shore, 3 miles northward of Round Point, are of small extent, the highest being 6 ft. above high water. There is a large stream 1 mile southward of the rocks.

Marmot River, on the eastern shore, 2 $\frac{1}{2}$ miles from the mouth of Bear River, flows through an extensive valley, and a sandspit extends 3 cables off its mouth. At the head of the valley are three conspicuous peaks, 4,000 to 5,000 ft. high.

Salmon River, on the western shore, 1 $\frac{1}{2}$ mile from Bear River, is separated from that river by a range of bare mountains, 4,000 to 5,000 ft. high, named *Reverdy Johnson Mountains*. It is a stream of considerable size. In 1868 the surveyors found a party of about 200 natives here, engaged in fishing. They were very civil, and were wonderfully dexterous in managing their canoes.

Bear River flows between high mountains, through an extensive wooded valley and flat, at the head of Portland Canal, and divides near its mouth into several streams. The Observation Spot, at the wooded high-water mark of the point near the centre of the mouth of Bear River, is in lat. 55° 56' 3" N., long. 130° 3' 27" W. The river rises 10 miles inland, at the foot of *Disraeli Mountains*, the highest peak of which is a snow-clad pinnacle, 7,000 ft. high.

The Bear and Salmon Rivers have a mud-flat extending across their mouths, rendering communication, even by canoes, difficult at low water.

The edge of the bank is very steep, and anchorage was unsuccessfully searched for.

Tides.—It is high water at the head of Portland Canal, on full and change, at 1^h 30^m; spring rise from 23 to 30 ft. In August, 1868, a current of about 1½ mile an hour was observed, setting down the canal, to 25 miles below Bear River.

HECATE STRAIT divides Queen Charlotte Islands from the coast just described. In its S.E. part the water is deep. From Skidegate across to within 10 miles of the mainland, in a N.E. direction, the depths are from 8 to 25 fathoms; in some cases, growing kelp was passed through by the surveying vessel *Beaver*, 1866, in 8 and 13 fathoms. In lat. 53° 26' N., long. 131° 6' W., a shoal has been reported, but its position is doubtful. The northern part of the strait between Rose Spit and Stephens Island, its narrowest part, is 28 miles wide. The tides are described at the end of this chapter.

QUEEN CHARLOTTE ISLANDS.

One of the most important features of this region, as yet but little known and undeveloped, is the extensive archipelago, named Queen Charlotte Islands, which is imperfectly described as follows.

This land was discovered nearly at the same period by the navigators of two nations. La Pérouse made the outer coast on August 10th, 1786, and followed it from South to North, for 50 leagues, in the ensuing ten days. Capt. Lowrie, in the *Snow*, Capt. Cook and Capt. Guise, in the *Experiment*, sailed from Nootka on July 27th in the same year, and made the land in question soon afterwards, though the day itself is not now known. Thus the honour of discovery belongs to both the English and French. The name by which it is now known is derived from the vessel in which Capt. Dixon made it in the year following, but only assumed that it was an island from conjecture, as it was not proved to be such till Capt. Douglas, in the *Iphigenia*, sailed through the strait which divides it from the continent of America. It has also been called *Washington Island*, by Ingraham. Dixon Channel, which runs in between Queen Charlotte Islands and the Prince of Wales Archipelago, to the North of it, was discovered, perhaps, by Ensign Juan Perez, in 1774. It was next seen by Dixon, on July 1st, 1786, though he himself acknowledges that Capt. Douglas was the first who sailed through it. He then sailed nearly round the island, afterwards repairing to Nootka Sound. The eastern coast of the island was also examined and traded on by Capt. Duncan, in the *Princess Royal*, in 1787; after doing so he proceeded to the eastward to some other islands, which he named the Princess Royal Islands (which have been before described), but which have been supposed to be identical with the

Archipelago of San Lazaro of De Fonta, previously considered to be apocryphal. A part of the features of this latter were examined by Duncan, and he anchored in *nineteen* of its harbours, not without being frequently exposed to the danger of losing his vessel, but he was indemnified by an ample trade in furs.

The outer or western coast only was cursorily examined by Vancouver in 1794, and the North side was sailed along by Capt. D. Jacinto Caamano in 1791. That it consisted of several islands instead of one, as had usually been considered, was inferred by Dixon, or rather by Beresford, who wrote part of his voyage in 1787.

Thus our knowledge remained until quite a recent period, although it was regularly visited by traders. But when the adjacent countries became the scene of much interest from the discoveries of gold and coal, this group was also visited with the same object, and in 1853, H.M.S. *Virago* went around them, and to Mr. Geo. H. Inskip, R.N., and the officers of others of Her Majesty's ships which have visited various parts of the islands since that time, we owe some of the ensuing nautical description. It was examined in some parts, when gold was reported,* by Mr. Downie in July, 1859.

A more complete examination of the geology and natural history of the group was made by Robert Brown, Esq., F.R.G.S., in 1866, and from his paper to the Royal Geographical Society in 1869, we also have derived some information.

In 1878, Dr. G. M. Dawson, under the direction of the Geological Survey of Canada, made a partial examination of these islands, both topographical and geological, and his valuable and interesting Report was published in 1880, in the Report of the Geological Survey of Canada, 1878-9, thus adding much to our previous knowledge of the group. He states that, with the exception of minerals, it would appear that the fisheries and forests of these islands will, at present, constitute their chief claim to attention. We are indebted to this Report for the greater part of the ensuing description of the eastern and northern coasts.

Natives.—The natives of Queen Charlotte Islands, the Haida Indians, are a finer race than the Vancouver or coast Indians, and although very dirty, are much cleaner in their personal appearance. They have a much fairer complexion, some of them almost resembling Europeans in their features. They are very skilful in the use of their canoes, making long voyages in them to Sitka, Port Simpson, Victoria, &c. In 1841 they were estimated to number about 8,300, but since their contact with Europeans they have been much

* There was a tradition that a Sandwich Islander, in the employ of the Hudson's Bay Company, while skinning a deer sold by an Indian, found that it had been shot with a nugget of gold.—*R. Brown, Esq.*

reduced in numbers by disease, the population being estimated at between 1,700 and 2,000 in 1878. The possession of slaves is allowed, and there are several of this unfortunate class amongst them; their owners are not held responsible for their manner of treating them, which is stated to be frequently very cruel.

The whole of the islands are portioned off amongst the different tribes and families, and as they have very strict notions of the rights of property, the acquisition of land is very difficult for settlers. The permanent villages are generally situated with regard to easy access to the fisheries, and the houses have curiously carved wooden pillars in front of them. Fish forms the chief article of food, the seas here swarming with various sorts, as halibut, salmon, herrings, pollock, cod, &c. From April to October the shell-fish are reputed by the natives to be poisonous. At Skidegate there is a factory for extracting oil from the livers of a species of dog-fish. Immense flocks of wild geese and ducks at times visit the islands. Potatoes grow in abundance in most parts, and thrive exceedingly well, forming an important article of food among the natives. These are all to be bought either for money, strong cotton shirts, cotton dresses, plain cotton, knives, tobacco, mother of pearl jacket-buttons for ornamenting their blankets, or any of the articles commonly bartered among savages. The blanket is the recognized currency among the natives, the unit of value being one worth a little over 1½ dollar.

Coal is found at Skidegate Inlet and Masset Harbour, that found at the former being similar to anthracite, and at the latter it resembles cannel coal. Copper deposits exist at various places, and have been worked. Gold has also been found in considerable quantities.

Climate.—Though situated so far North, the climate of the Queen Charlotte Islands, from their insular position, is much milder than that of the mainland. Some men who wintered upon them described the temperature as being moderate, little snow, and a great deal of rain. Indeed, all North of Fraser River the climate is very moist. At Sitka it rains almost continuously, the average rainfall amounting to nearly 89 inches per annum. When I arrived, on 1st of April, all the snow had vanished off the low lands, and the weather was mild and pleasant. Mosquitoes were abundant, and towards the end of the month humming-birds had begun to make their appearance.—(R. Brown.)

South-east winds are prevalent, and are almost invariably accompanied with thick rain; those from the opposite quarter generally bring fine weather.

The heaviest rainfall is, however, local, taking place on the western mountainous axis. It may often be noted that while heavy rain is falling on the mountains the sky is comparatively clear over the strait to the eastward. The general remarks on Winds given for the coast to the southward (see pp. 390-2) apply almost equally well to those of Queen Charlotte Islands, so far as the

observations made in their vicinity show. Strong tidal currents prevail in the waters surrounding the islands.—*Mr. G. M. Dawson.*

GENERAL REMARKS.—The following sailing directions for the Queen Charlotte Islands commence at Cape St. James, their southern extreme, and from thence proceed along their eastern side, named Hecate Strait; round Rose Spit, their north-eastern point; along the northern shore through Dixon Entrance or Parry Channel; and back to Cape St. James, by the Pacific or western side.

The Queen Charlotte Islands consist of three principal islands, together with several smaller ones, and are situated between lat. $51^{\circ} 50'$ and $54^{\circ} 15' N.$, and long. $130^{\circ} 55'$ and $133^{\circ} 10' W.$ The channels separating the principal islands are, Houston Stewart Channel, running between Prevost Island (the southernmost), and Moresby Island to the northward of it; and Skidegate Channel which separates Moresby Island from Graham Island (the northernmost).

The islands may be regarded as a partly submerged mountain range, being a continuation northward of that of Vancouver Island. A line drawn from their southern extremity to their N.W. point has a bearing of N.W. $\frac{1}{4}$ W., and this may be taken as the direction of the mountain axis. The extreme length from point to point is 156 miles; the greatest width 52 miles. The highest and most rugged part of the mountain axis is in lat. $52^{\circ} 30'$, where many peaks bear considerable patches of perennial snow, and rise to altitudes probably surpassing 5,000 ft.—*Mr. G. M. Dawson.*

Between the South extremity and Skidegate Inlet, the East coast is much indented by inlets, generally having bold rocky shores, and forming numerous islands. The West coast, which is much more precipitous and rugged than the eastern shore, has not yet been much examined.

CAPE ST. JAMES was so named by Mr. Dixon from the common circumstance of the saint's day on which it was first seen, 1787. It is the southern extremity of an island about a mile in diameter, and 1,000 ft. high, its southern part being a white cliff, about 180 ft. high. In approaching Cape St. James from the southward, the first land that will be seen (if it is clear) is the highest part of Prevost Island, about 2,000 ft., at the back of Cape St. James.

A chain of rocky islets and rocks, with vertical sides, named *Kerouart Islets* by La Pérouse, extend $3\frac{1}{2}$ miles south-eastward of the cape, and as it is reported that a sunken ledge extends nearly 5 miles off it, precaution is necessary in approaching this part of the coast. Mr. Gray, in the *Columbia*, informed Vancouver that he had struck and received some material damage upon a sunken rock, which he represented as lying at a much greater distance than the above, though nearly in the same line of direction. With Cape St. James bearing W. by S. $\frac{1}{4}$ S. about $3\frac{1}{2}$ miles, and the outermost rock above water S.W. $\frac{1}{2}$ S., Mr. Inskip had 90 fathoms. As seen from the N.E. these

islets appear to form three groups, those lying close to the cape being about 180 ft. high, and the outer ones about 100 ft. high.

PREVOST ISLAND is about 12 miles long North and South, its eastern and western coasts being bold. Between Cape St. James and *East Point*, a well-defined headland 12 miles northward, the East coast is indented by two bays or inlets, the southern apparently inconsiderable; *Luzana Bay*, the northern one, is probably 3 or 4 miles in depth. After rounding *East Point* the eastern entrance to *Houston Stewart Channel* will open out, the coast between this point and *Moore Head*, on the South side of the entrance, a distance of 6 or 7 miles to N.W., being much broken, with several small islets lying off it, and one round thickly-wooded and conspicuous island, 150 ft. high, a good guide for the entrance of the channel.

HOUSTON STEWART CHANNEL trends $2\frac{1}{2}$ miles from *Moore Point* to *Hornby Point*, and thence 3 miles S.W. to its western entrance. At about 4 miles from the eastern entrance there is a depth of 90 fathoms, and the water gradually shoals to 20 fathoms to within a mile of it; thence the soundings are very irregular, varying from 30 to 7 fathoms. In the entrance, which is about a mile wide, there is 20 fathoms water. A strong tide runs through the channel.

The country around this locality is mountainous and thickly wooded; but the timber is smaller, and less valuable than that in the magnificent forests of *Vancouver Island*. The soil is poor, but there are indications of copper in different places. The sea otter, the fur of which fetches very high prices in *China*, are (or were) numerous.

Within the northern point (*Forsyth Point*), and on the same side, is a snug bay, bordered by a sandy beach, at one-third of a mile off which there is secure anchorage in 16 fathoms. At a quarter of a mile inside *Forsyth Point*, and a little to the northward of the line of direction of the channel, is a rocky patch with kelp, dry at low water springs; a vessel therefore should not haul to the northward too soon after entering. On the southern side are some small wooded islands, here and there fringed with oily patches of kelp, which latter should always be avoided. At $1\frac{1}{2}$ mile W.S.W. from *Forsyth Point* is *Trevan Rock*, lying nearly mid-channel, contracting the passage on its northern side to rather less than half a mile. Eastward of *Ellen Island*, the largest of the islands, there is good anchorage in 14 fathoms, mud.

The southern arm of this channel is about 3 miles long, and three-quarters of a mile wide, with several small islands (the *Shangoi*) at its southern end or entrance from the Pacific. A vessel coming from the southward, and wishing to go in by this entrance, when abreast of Cape St. James, should close the land to $1\frac{1}{2}$ mile, and follow it along for about 12 miles, which will lead right into it. Two white stripes down the mountains, 6 or 7 miles to the N.W., form excellent landmarks. By leaving *Anthony Island*, the largest and outer *Shangoi Island*, on the port hand, the channel will show itself. *Flat Rock*,

50 ft. high, which should be kept on the port hand, will form a good guide. Anthony Island is 200 ft. high, with white cliffs, and off its southern end an extensive ledge of rocks projects to the S.W. On the inner side of the island is *Ninintia*, an Indian village; the natives are stated to be very wild. *Loucoone*, on the North side of the channel, just within Anthony Island, is said to be a good harbour.

Rose Harbour, the northern arm of Houston Stewart Channel, is secure and capacious, running up in a northerly direction for 3 miles from its junction with the channel, and is a continuation, in nearly a straight line with the western portion of it. It is about three-quarters of a mile wide, and anchorage will be found in 6 to 15 fathoms, but there is kelp and shoal water along its eastern shore. The basin at its head is full of islets and rocks, and should not be entered; a stream, named *Sedmond River*, enters the western side of this basin, and the eastern side is only separated from Carpenter Bay by a narrow isthmus.

About 3 miles to the northward of the eastern entrance to Houston Stewart Channel, and at about 2 miles off the coast, are *Danger Rocks*, a ledge of rocks lying a little above water; the sea breaks violently over them, and for a considerable distance around.

MORESBY ISLAND, the centre of the three principal islands, is 72 miles long, but in places is only from $1\frac{1}{2}$ to 2 miles in breadth. Near its centre are the *San Cristoval Mountains*, upwards of 5,000 ft. in height.

CARPENTER BAY, at the S.E. end of Moresby Island, is a little over 2 miles wide, and runs westward about 5 miles, ending in a narrow arm, which receives two streams; this arm is filled with islets and rocks, making it unsafe even for small craft. The coast is like that of Houston Stewart Channel. In June, 1878, there were many seals in the bay. On its South side are two small bays, the western of which, *South Cove*, has in its head good anchorage for a small vessel in 6 to 10 fathoms. It is sheltered by a little rocky reef which runs out from its East side.

Rankine Islands lie $1\frac{1}{2}$ to 2 miles N.E. of *Iron Point*, the North point of Carpenter Bay. *Collison Bay*, situated midway between the latter and Skincuttle Inlet, is about $1\frac{1}{2}$ mile wide at its entrance, and has a probable depth of 2 miles, running up into a narrow arm, which was not examined. Several islet and rocks lie in its mouth, and it does not appear to be serviceable as a harbour. *Gull Rock*, 10 ft. high, bears N.E. by E. $\frac{1}{2}$ E., $1\frac{1}{2}$ mile from Deluge Point, and about the same distance from the North point of Collison Bay. *Inner Low Rock* lies S.S.E. from Gull Rock, and midway between it and the shore.

SKINCUTTLE INLET is $5\frac{1}{2}$ miles deep in a S.W. direction, its entrance being 4 miles wide, between *Deluge Point* on the South and *Granite Point* on the North. The North side of the inlet is formed by Burnaby Island, and its shores resemble those of other parts of the islands already described. The

entrance is South of a chain of islands, called the *Copper Islands*, lying N.E. $\frac{1}{2}$ E. and S.W. $\frac{1}{2}$ W., on which is a deposit of magnetic iron ore, with a little copper pyrites. It is $1\frac{1}{2}$ mile wide, but should be used with caution as there is reason to believe that a rock, sometimes bare, lies in it. The passage to the North of Copper Islands is contracted. *Bolkus Islands* form a chain about 2 miles long East and West, in the centre of the inlet.

Harriet Harbour, the first opening on the South side of the inlet, is 2 miles westward of Deluge Point, and runs southward 1 mile, the entrance being West of Harriet Island, at its mouth. To enter, keep nearer the West side of the channel, and run some distance beyond the inner end of the island before anchoring, to avoid the shoal bank off its point. The depth is about 8 fathoms, with good holding ground. At $1\frac{1}{2}$ mile West of Harriet Harbour is *Huston Inlet*, a wide inlet running E.S.E. about 4 miles, and approaching the western side of Moresby Island to within about $1\frac{1}{2}$ mile.

At the western end of Skincuttle Inlet, are three indentations, *George Harbour* being the southern. The northern, at the entrance of Burnaby Strait, is *Tangle Cove*, a well-sheltered anchorage for a small vessel, but a shoal lies off its mouth; the entrance is between a small island at its South side, and two other little islets to the North, and in it lies a rock which uncovers. The mountains at the head of the cove are steep, and probably 3,000 ft. in height.

On the South shore of Burnaby Island is a bay, with several small islands across its mouth, which was not examined. Further East, near an abandoned copper mine, are *Blue Jay* and *Kingfisher Coves*. *Granite Point* is a rather remarkable whitish crag, nearly separated from the shore. Northward of this point is a deep bay, with a high island in its mouth. The coast of Burnaby Island between Granite Point and Scudder Point, 5 miles to N.N.W., was not examined.

Burnaby Strait, connecting Skincuttle Inlet with Juan Perez Sound, is 9 miles in length, the southern portion for a distance of about 4 miles being very narrow. It must be navigated with great caution as there are many rocks. *Dolomite Narrows*, at $2\frac{1}{2}$ miles N.W. of the entrance, are not more than a quarter of a mile wide; the channel is crooked, and obstructed by rocks and having only from 6 to 8 ft. at low tide. The tides, however, are not strong. Just South of the narrows, on the West side, is the entrance of *Bay Harbour*, expanding within to a basin nearly a mile in diameter. Near the East side of the narrows, are *The Twins*, two conspicuous mountains about 1,500 ft. high. *Island Bay*, at $1\frac{1}{2}$ mile north-westward of the narrows, is probably too rocky for a safe harbour.

Skaat Harbour, on the West side of the North entrance to Burnaby Strait, is a bay $2\frac{1}{2}$ miles wide at its entrance, with a depth of about 3 miles, terminating in a narrow inlet in its upper part. In its mouth lies Wanderer Island and several smaller ones, the entrance, which is very narrow, being on the South side. It has not been carefully examined, but would be likely to afford

good anchorage, especially westward of Wanderer Island. On the South side of the entrance are two small coves affording anchorage for a small vessel, but with wide tidal flats at their head.

Limestone Rock is a dangerous reef, bare only at low water, lying in mid-channel, off the entrance to Skaat Harbour, and a mile to E. by S. $\frac{1}{2}$ S. of Centre Island; the eastern point of Wanderer Island in line with that of Centre Island, leads over it.

All Alone Stone and *Monument Rock* form good marks to the northern entrance of Burnaby Strait. *Huzley Island*, southward of them, is nearly 2 miles long North and South; it is bold, and rises rapidly to a height exceeding 1,000 feet.

The North shore of *Burnaby Island*, $5\frac{1}{2}$ miles in extent N.E. and S.W., has a few shallow bays, one of which, near the western end, is called *Section Cove*; the hills are estimated at 300 to 500 ft. in height. A considerable width of low land stretches back to *Seudder Point*. *Alder Island*, near the centre of this stretch of coast, is about half a mile in diameter, with probably a good anchorage behind it, which should be approached from the North, as *Saw Reef* runs out from the shore of Burnaby Island to the eastward, and this part of the coast is broken and rocky, with large fields of kelp extending off it.

JUAN PEREZ SOUND has, at its entrance between the North end of Burnaby Island and Ramsay Island, a width of 8 miles. It thence runs $13\frac{1}{2}$ miles westward, giving off a number of smaller inlets and bays, none of which seem to be well adapted for harbours, as the shores are bold and rocky, and the water to all appearances too deep for anchorage. Vessels entering the sound should pass southward of Ramsay Island; the water is apparently deep but it has not been sounded. It is continued in a W.N.W. direction by Darwin Sound, leading to the upper ends of the inlets running westward from Laskeek Bay.

Bischoff Islands, in the N.W. part of the sound, are low, but densely wooded. There is sheltered anchorage for small craft between the two larger islands, entered from the westward, and with much caution, being surrounded by rocks and sunken reefs. *Ramsay*, *Murchison*, and *Faraday Islands* are the largest of a group of islands forming the N.E. side of the sound, occupying a space of about $8\frac{1}{2}$ miles eastward of Lyell Island, with numerous islets and rocks between them. On the South side of *Hot Spring Island*, between Ramsay and Murchison islands, is a hot spring, which is easily recognised by a patch of green mossy sward. Between Hot Spring and House Islands, to the N.E., is a good anchorage for small craft. To the N.N.W. of Murchison Island a chain of islets extends about 4 miles, and are named *Tar Islands*, as the Indians report that on one of them bituminous matter is found. These islands are only approximately placed on the chart.

Lyell Island, on the North side of Juan Perez Sound, is about 15 miles in

length East and West, and is separated from Moresby Island by Darwin Sound. It is densely wooded and hilly, attaining towards the centre a height probably exceeding 1,000 ft. *A-ili Inlet*, on the North side, has not been examined, but does not appear to be a good harbour. About 3 to 4 miles E.N.E. from the N.E. point of Lyell Island is *Halibut Bank*, with 23 fathoms on it, brown sand bottom.

Darwin Sound is 12 miles in length N.W. by W. and S.E. by E.; it is irregular in width, but is a fine navigable channel. In entering from the southward, *Shuttle Island*, low and rocky, should be left on the port hand. A mile beyond the North end of Shuttle Island, and in mid-channel, is a low rock, with another, bare only at low water, a short distance to the North of it. The flood tide sets up the sound from the southward, the tidal streams running at the rate of about 2 knots when strongest.

The S.W. side of Darwin Sound for 4 miles from the South entrance is rocky and broken, with several coves and inlets. *Bigsby Inlet* then runs in $2\frac{1}{4}$ miles in a westerly direction, a gloomy chasm, scarcely half a mile in width, and surrounded by mountains, probably as high as any in the islands, rising steeply from the water. At $1\frac{1}{4}$ mile northward of Shuttle Island is *Echo Harbour*. The entrance looks like a shallow cove, into which Mr. Dawson entered to look for anchorage, and was surprised to find the passage into the harbour, running southward about a mile, and surrounded by high hills, which towards its head rise to rugged mountains. The entrance has a depth of 10 fathoms in it; the sides then approach, leaving a channel scarcely 300 yards wide. In the harbour the depth is everywhere about 15 fathoms, decreasing toward the flat at the head. The bottom is soft mud, and excellent holding ground.

At 2 miles West of the entrance to Echo Harbour, the shore line falls back forming *Klun-Kwoi Bay*, which runs up in several arms, its head approaching Tasoo Harbour to within a couple of miles. The mountains appear to culminate here, the highest peaks being probably 5,000 ft. or more in altitude. *Crescent Inlet* extends N.W. from the head of Darwin Sound, and then turns gradually to a direction nearly S.W., and is over 4 miles in length, with steep mountains and wooded sides. *Red Top Mountain*, about 3,000 ft. high, is a conspicuous peak, rising on the North side of the inlet, at the angle of the bend.

LASKEEK BAY is the wide indentation between the N.E. extreme of *Yal* Island and Vertical Point, the S.E. point of Louise Island, 10 miles to the N.W. From Laskeek Bay four large inlets run westward. *Richardson Inlet*, the southernmost, is about 11 miles in length W.S.W. and E.N.E., with an average breadth of $1\frac{1}{4}$ mile, its shores being moderately bold. The southern side is formed by Lyell Island; the northern by *Kun-ga*, *Tan-oo*, and *Inner Islands*. *Kun-ga* Island, about 1,500 ft. high, forms a good mark for the entrance; a low rocky reef extends some distance eastward of its outer

point, and another off its South shore. Tan-oo and Inner Islands are also bold, rising to rounded hills of about 800 ft. Near *Dog Island*, 5 miles within the entrance, are several small islets and rocks; and at about $3\frac{1}{2}$ miles S.W. by W. of it, on the South side of the inlet, is a cove, where a small vessel can find a convenient anchorage. The channels between Kun-ga and Tan-oo and the latter and Inner Islands are probably deep; several rocks and patches of kelp lie off the East end of Tan-oo. The tide runs through this passage with considerable strength, and it is unsuited as an approach to Echo Harbour.

Laskeek or *Klue* village, on the eastern extremity of Tan-oo Island, is one of the most populous in the islands. H.M.S. *Alert* anchored off here in 11 fathoms, about 2 cables East of the village, but this anchorage is not a good one, being exposed to the N.W. and S.E. winds, and steep close-to. The S.W. end of Richardson Inlet is only about a quarter of a mile wide, and obstructed by a small island and several rocks.

Logan Inlet is about 7 miles in length, and nearly parallel to Richardson Inlet, with *Flower Pot Islet*, covered with trees, in its mouth. It constitutes a fine navigable channel, the best approach to Echo Harbour. Vessels should pass North of Flower Pot Island, and keep in mid-channel. *Ti-tul Islet*, northward of Kun-ga Island, has low limestone cliffs.

Dana Inlet, northward of Logan Inlet, runs about S.W. by W. nearly 8 miles, with bold shores. In its mouth is *Helmet Islet*, high and rocky, with another close southward of it; this must not be mistaken for Flower Pot Island, in the mouth of Logan Inlet. At its western end Dana Inlet turns to W.N.W., communicating by a narrow but apparently deep passage with Selwyn Inlet, and thus insulating *Tal-un-kwan Island*. This island is 8 miles long, and 2 miles broad; the hills are rounded, and from 800 to 900 ft. high.

Selwyn Inlet is nearly parallel to Dana Inlet, and about 10 miles in length; near its head it turns to N.W. by N., forming at high water a narrow passage for canoes into the upper part of Cumshewa Inlet, and insulating Louise Island. *Entrance Islet* lies off the North entrance point of the inlet, with a low rock about a mile eastward of it. After giving these islets a wide berth, a vessel should keep the North shore on board for a distance of 5 miles, until the entrance of Rock-fish Harbour is reached. *Rock-fish Harbour* is formed by a boot-shaped projection of low land, at the angle of Selwyn Inlet. It runs to W.S.W. for about $1\frac{1}{2}$ mile, with a width of half a mile, and an average depth of 15 fathoms. It is a secure and well-sheltered anchorage, more easily entered than Cumshewa Harbour.

Reef Island and *Low Islands* lie in the outer part of Laskeek Bay, their position on the chart being uncertain. The southern and first-named is steep, and a reef runs off about half a mile southward of it.

Louise Island, separating Selwyn Inlet from Cumshewa Harbour, is about
North Pacific.

15 miles long East and West, and 8 miles broad. The mountains are from 3,000 to 4,500 ft. high, with snow in abundance. From Selwyn Inlet the East coast runs N. by E. 8 miles, to Cumshewa Inlet, with several small open bays. *Vertical Point* projects about halfway along this stretch of shore, and is remarkable from the beds of grey limestone of which it is composed. North of it are the two *Limestone Islets*, behind which the ebb tide forms a race. *Skedans Bay*, northward of these islets, is strewn with sunken rocks, and should on no account be entered by vessels. A large stream enters its head, at some distance inland forming a high waterfall. Skedans village is at the head of a cove indenting the South side of a narrow isthmus, connecting two remarkable nipple-shaped hills with the shore. Between this peninsula and the *Skedans Islands*, the tide forms a race. These islands are low and covered with trees; their position on the chart is only approximate.

CUMSHEWA INLET runs about 15 miles to W.S.W., and differs, in the low character of its northern shore, from the inlets to the South. There is also more beach than in the southern inlets, and wide tide-flats. In the entrance northward of Skedans Islands the depth is about 20 fathoms, shell and gravel bottom. Off the North point of the entrance is *Cumshewa Islet*, a barren rock, whence the *Cumshewa Rocks* extend nearly $1\frac{1}{2}$ mile to E.S.E. *Kin-gui Island*, just within this point, was covered with dead trees, and can be recognised easily.

At about a mile within the entrance, an extensive breaking shoal runs off from the South shore to within about half a mile of the North shore; the passage in is through this channel, in which the depth is reported to be 7 and 8 fathoms, the tides running strongly through it. A few patches of the shoal dry at low water, but the greater part is indicated only by the kelp, which grows thickly on it during the summer.

Within the narrows, on the North shore, is *McKay Cove*, where a small vessel may find a pretty secure anchorage. *Cumshewa* village lies about a mile westward of McKay Cove; a small rocky islet lies off it. The best anchorage for a large vessel in Cumshewa Inlet is probably on the South side, in about 6 fathoms, nearly opposite the peninsula westward of the village, and abreast a stretch of low land at the entrance of a stream.

From Cumshewa Islet, the coast runs W.N.W. to Spit Point, the South point of Skidegate Inlet, a distance of 17 miles, and is indented by Gray and Copper Bays. At *Copper Bay*, about 5 miles from Spit Point, is an abandoned copper mine. The land is low, rising to a height of about 200 ft., and is densely wooded. The projecting points are generally low and flat, and formed of gravel deposits. With the change in the character of the land, the beach becomes flat, and shoal water extends far off shore, the depths shoaling from 10 fathoms, at 3 miles off Cumshewa Islet, to 6 and 7 fathoms at 7 miles off Spit Point. Lieut. Boxer, H.M.S. *Alert*, says that *Cape Chroustcheff*, 2 miles

southward of Spit Point, should not be passed nearer than 5 miles; the cape is low and dark-looking.

SKIDEGATE INLET and **CHANNEL** separate Moresby Island from Graham Island. The inlet or entrance to the channel was surveyed by Lieut. Daniel Pender, R.N., in 1866. The harbour is very spacious, and communicates with the Pacific southward of Cartwright Sound, near Point Buck, by an intricate channel, only navigable for canoes a portion of the way through.

Skidegate Inlet runs in a southerly direction for about 9 miles from Bar Rocks, and then contracts to a width of $1\frac{1}{2}$ mile between Image Point and the South shore. Within this it opens widely, forming two expansions, separated by Maude Island, the northern arm containing many islands and islets, of which *Lina Island* is the largest. North-eastward of Lina Island is *Bearskin Bay*, on the N.E. side of which there is anchorage in 12 fathoms, and from thence the inlet trends 5 miles to the S.W., and then turns to W.N.W., forming *Long Arm*, the total length of the inlet from Bar Rocks to the head of Long Arm being about 21 miles. The southern arm forms *South Bay*, in which is *South Island*, its western side passing into Skidegate Channel and thence to the Pacific.

The shores of Skidegate Inlet are not so bold as those of the inlets to the South, and are generally fringed with a beach. Westward of Image Point the land increases in height, culminating at Long Arm, where there are several summits, 3,000 to 4,000 ft. high. The surrounding country is densely wooded, and timber of magnificent growth is found, chiefly Menzies spruce, and apparently well-suited for lumber.

Spit Point is low and woody, and composed of sand deposits, which, extending northward, form the bar across the entrance. The bar or spit has from 1 to 3 fathoms water on it, sloping off very gradually seaward, and extends in a north-westerly direction for about $9\frac{1}{2}$ miles, to within nearly $1\frac{1}{2}$ mile of Lawn Point, the northern point of entrance. *Bar Rocks*, which do not always break, lie on the outer edge of the spit; the western one dries 5 ft., and lies N.W. $\frac{3}{4}$ N., $6\frac{1}{2}$ miles from Spit Point; the outer rock dries 1 foot, and bears N.E. by E., 4 cables from the inner rock.

Lawn Point is generally green, and a hill 500 ft. high rises close westward of it. The coast hence to S. by E. is flat for 10 miles to Village Bay, and was covered with standing dead trees. *Dead Tree Point*, $3\frac{1}{2}$ miles southward of Lawn Point, is a projecting part of the coast, but otherwise is not conspicuous. *Village Islands* form good marks for Skidegate Inlet; the northern one, Bare Islet, 125 ft. high, is almost bare, and the other, Tree Islet, having trees upon it, is 153 ft. high. The village of *Skidegate*, nearly half a mile in length, is situated in the bay fronted by Village Islands. *Village Bay* is good stopping-place, with anchorage in 14 fathoms, between Bare Islet and the beach. Should a S.E. gale spring up, good shelter will be found in Alliford Bay.

In the cove at *Image Point*, southward of *Village Bay*, some buildings have been erected in connection with the dog-fish fishery. In 1883 the Skidegate Oil Company extracted 40,000 gallons of oil from the livers of about 400,000 dog-fish, which were caught by the Indians. This oil is stated to be superior to any other kind as a lubricant, and is chiefly shipped to the United States.

Alliford Bay, on the South side of the entrance, is an excellent anchorage, with good holding ground, in about 9 fathoms. *Leading Island*, forming the western part of the bay, is 400 ft. high and appears round. The passage between *Flowery Islet*, the outer islet, and the North point of the bay, should not be used. Wood and water may be obtained here.

Anchor Cove, 10½ miles south-westward of *Image Point*, affords anchorage in 5 fathoms. About a mile northward of the cove is *Slate Chuck Brook*, the largest stream in Skidegate Inlet, so named from a quarry a few miles up it, from whence the Indians obtain the dark shaly material they use for carvings.

Coal.—About a mile north-eastward of *Anchor Cove* is the now abandoned *Cowgitz coal mine*,* on the sides of *Mount Seymour*, the working of which was undertaken by a company formed in 1865. A tramway was constructed to the coast, and much money expended, up to the abandonment of the works in 1872. In 1869 about 800 tons were raised, and part shipped to *Victoria*. In appearance the coal resembles anthracite, but the seam is irregular in quality and thickness. Coal is also found in *Saltspring Bay*, to the S.E. of *Anchor Cove*, and on the South side of *Skidegate Passage*.

Maude Island is nearly 4 miles long, S.W. and N.E., 1½ mile broad, and 1,260 ft. high. On the West end the Indians belonging to *Gold Harbour* have established a village.

Skidegate Channel runs from *South Bay* for 15 miles south-westward to the Pacific, and about midway *North Arm* runs 2½ miles northward. From *South Bay* to *Log Point*, a distance of 8½ miles, the channel is contracted, particularly in the East and West Narrows, the former in one part being only 200 ft. wide, and the latter 2 cables; it can only be considered navigable for boats or canoes. A small vessel might pass through, but the narrows must be passed at slack water of high tide, so that both narrows cannot be got through in one tide. The tides meet about the East Narrows, running with great strength, probably 5 knots in several places. (See pp. 586-7).

Directions.—Approaching *Skidegate Inlet* the water should not be shoaled under 6 fathoms at low water until the leading marks are on. A deep channel into *Skidegate Inlet* may be found northward of *Bar Rock spit*, by steering for *Lawn Point* bearing S.W. until within about a mile of the point, when a general S.S.E. course may be steered, paying great attention to the soundings,

* This was found by Capt. Torrens in 1859, but the party were nearly murdered by the Indians. It was examined by Mr. Brown in 1866, and he says the coal has all the character of anthracite, but altered and metamorphosed by the presence of igneous rock in a remarkable manner.

as the northern part of the channel is narrow. Lieut. Miller, H.M.S. *Amethyst*, 1876, remarks, "From the N.E. Lawn Point makes like a bluff sloping towards the North. Large ships should bring it to bear S.W. and steer for it; the water will gradually shoal from 10 and 12 fathoms at 4 miles off, to 5 and $4\frac{1}{2}$ fathoms at about a mile from the point, when it suddenly deepens to 12 and 20 fathoms."

The West side of Leading Island, in line with the East side of Bare Village Island, bearing South, leads northward of Bare Rocks, in 15 ft. at low water. Coasters with local knowledge cross the spit in $3\frac{1}{2}$ fathoms, about a mile South of Bar Rocks (when they are visible), by keeping Dead Tree Point bearing W.S.W.

It is high water in Skidegate Inlet, on full and change, at 1^h; springs rise 17 ft., neaps 14 feet.

GRAHAM ISLAND, the largest of the Queen Charlotte Islands, is 67 miles long with a maximum width of 52 miles. At its southern end, on the North side of Skidegate Inlet, the land is very rugged and mountainous, with many summits exceeding 3,000 and 4,000 ft. Beyond Skidegate the surface becomes much less mountainous. To the northward lies a low, flat or gently undulating, densely wooded country, seldom exceeding 300 ft. in elevation.

From Lawn Hill to Rose Point, the N.E. extreme of Graham Island, the distance is about 48 miles to N. by W. The coast is straight and open, with no harbour, the beach being gravelly or sandy. Dangerous flats, which have not been examined, extending off the coast, should be given a berth of 6 or 7 miles, and the lead kept constantly going, the soundings varying from 9 to 11 fathoms.

For many miles northward of Lawn Hill, banks of clay and sand are found along shore, and for about 17 miles northward of Tl-ell River these frequently rise into cliffs 50 to 100 ft. in height. Northward of the cliffs the shore is usually bordered by sandhills, covered with coarse grass, &c. This part of the coast is also characterised by lagoons; the largest opens at *Cape Fife*, about 6 miles southward of Rose Point, and runs southward for some miles. Its mouth forms a safe harbour for boats at high tide, but it is nearly dry at low water. On some parts of the shore near Cape Fife magnetic iron sand is abundant, with numerous "colours" of gold in it. There is anchorage off the cape with off-shore winds; but the lead must be most carefully attended.

Tl-ell River, a stream of some size, enters the sea at $10\frac{1}{2}$ miles N.N.W. of Lawn Point. *Cape Ball* (Kul-tow-sis), nearly 20 miles from Skidegate Bar, is very conspicuous, having a remarkable white cliff on it, with lower cliffs on either side; it cannot be mistaken, for there is no other place like it between Skidegate and Point Rose. The Indians report that at very low tide patches of clay appear a long way off the cape. Capt. McNeill, of the Hudson Bay Company's Service, states that he found a rock with 2 fathoms on it, lying about 6 miles East of Cape Ball.

ROSE POINT, so named by Douglas in 1788, or *Invisible Point*, known to the Indians as *Nai-Koon* (long nose), is a remarkable low promontory, apparently formed by the meeting of the currents and waves. Where the point becomes narrow and more exposed, it is clothed with small stunted woods, which in turn give place to grass-covered sandhills. Beyond this the narrow gravelly point is covered above high-water mark with heaps of drifting sand, and great quantities of bleached timber. The apex of the point is a narrow steep-sided gravelly bank, which runs out for a long distance at low water. A dangerous spit runs off Rose Point in a N.E. direction, and is reported to extend for a distance of nearly 5 miles. The point should, therefore, at all times be given a wide berth. Several vessels have been lost here.

The shore between Rose Point and Masset Sound forms a large bay 22 miles in width. With the exception of a few small rocky points, the sandy beach is smooth and regular, low sandhills generally bordering the woods. The water is shoal far off the shore, especially at the bottom of the bay, and on approaching Masset Sound, where kelp forms wide fields at a great distance from the beach. In the N.E. part of the bay there is anchorage with off-shore winds.

Hi-ellen River, at $8\frac{1}{2}$ miles S. by W. of Rose Point, is frequented by salmon in the autumn; its mouth forms a good boat harbour. On its West bank is *Tow Hill*, an eminence remarkable in this low country, facing the sea with a steep cliff 200 ft. high. It is uncertain whether Tow Hill, a broad low elevation a short distance inland, near Cape Fife, is the same as the *Macroon* or *Macroon Hill* of the old chart. *Macroon Hill* is described as a round-shaped hill, 300 or 400 ft. high, which, with Rose Point bearing W.S.W., distant 6 miles, opens out clear of the land off which Rose Spit runs, but shows out so distinctly as to look almost like an island.

MASSET HARBOUR is about 23 miles S.W. $\frac{1}{2}$ S. from Point Rose. Its entrance is formed by a low point, with a ledge of rocks half a mile off it, and covered with kelp, on the western side; and the point of a spit (*Naiques*) partly dry (the surf usually breaking the whole length of it) on the eastern, the passage between having an extensive bar. With the outer western point bearing W. by N. 1 mile, there is 5 fathoms at low water; from this position the course in is about S. by E. $\frac{1}{2}$ E., the soundings over the bar varying from 5 to 3 fathoms, for about 3 miles, to abreast of a village on the western shore, a little more than a mile from what may be termed the inner or proper entrance to the harbour; the water then suddenly deepens to 9 and 11 fathoms, the channel lying in the direction of the eastern point of what has been called the inner entrance. Just inside, and round this point, is a pretty bay, with a beach containing the principal village, named *Ut-te-was*, off the centre of which there is anchorage in 10 fathoms, but the ebb tide runs very strong. In 1878 the Hudson Bay Company had a post here, and the Church

Missionary Society also had a station, but the inhabitants are decreasing in number. The company keep some cattle here.

The land in the vicinity of Masset Harbour is all low, no hills being visible, and generally densely timbered with fine spruce trees. At 3 miles up the sound, a lagoon or arm runs off on the East side, and nearly opposite this, on the West side, is *Maast Island*, from which the name of the inlet appears to have been taken; it is low and sandy, and a great part of the passage behind it is dry at low water.

Masset Sound, from its entrance to the point at which it expands to Masset Inlet, is 19 miles in length; it averages about a mile in width, and the depth appears to vary from 10 to 12 fathoms. A number of little streams enter it. On the eastern side, at $4\frac{1}{2}$ miles from the southern end of the sound, a narrow and shallow passage runs off southward to the eastern part of Masset Inlet.

Masset Inlet.—At its southern end Masset Sound expands suddenly to a great sheet of water, 17 miles in length East and West, and $5\frac{1}{2}$ miles across in its broadest part. This, to the northward and eastward, is bounded by low wooded land; and to the West and South by hills, rising to mountains in the distance; even these, however, are comparatively rounded in form, and probably exceed 1,500 ft. in height. The northern and southern shores are often bordered by wide shoals; the western half of the inlet is studded with islands, and has four large bays or inlets on its southern side. The shores here are steep, sloping down at once into deep water. Many streams flow into these inlets, the largest being probably the *Ya-koun*, which enters the S.E. corner of Masset Inlet, in the bottom of a shoal bay. This stream formed a portion of the disused route from Masset to Skidegate. The natives state that in August the inlet abounds with salmon, halibut, geese, and ducks. *Ain River*, on the northern side, is an important stream, said to flow out of a very large lake, not far inland.

Tsoo-skati.—On the South side of Masset Inlet, 5 miles from its eastern extremity, is a narrow passage, the mouth of which is partly blocked by islands, leading into a second great inlet called by the Indians Tsoo-skati, or "the belly of the rapid." Kelp grows abundantly in the channels, which therefore cannot be very deep; the tide here runs with great velocity, especially at ebb, when in the western channel it forms a true rapid. The inlet has deep water, is $9\frac{1}{2}$ miles in length, and from 1 to 2 miles in width, with many islands and islets in it. On the eastern side, $2\frac{1}{2}$ miles from its extremity, is *Tow-us-tas-in*, a remarkable hill with a steep cliff on one side. *Ma-min River*, navigable by small canoes for several miles, joins Tsoo-skati Inlet at its East end.

Tides.—The rise of spring tides, at the entrance of Masset Sound, was estimated at about 14 feet.

Between Masset and Virago Sound, which lies about 10 miles to the westward, there is good anchorage in some places, in which a vessel might remain

a night, instead of keeping under way, or cruising about with a S.E. wind, and the weather thick. The coast between these two places is everywhere low and wooded, with occasional open grassy spaces. It differs from the coast East of Masset, in being rocky or covered with boulders. The water is shoal far off shore, with wide fields of kelp, necessitating caution in approaching the shore.

VIRAGO SOUND, the entrance to Naden Harbour, is $3\frac{1}{2}$ miles wide between its outer points, *Edensaw* to the East and Naden to the West; and $2\frac{1}{2}$ miles deep to the narrow passage, which is $1\frac{1}{2}$ mile long and about half a mile wide, leading into the harbour. Outside the entrance of this passage are several banks, formed probably by the sand, &c., washed down with the ebb, which runs with considerable strength; the rise and fall of the tide is about 13 ft. The narrowest part of the entrance is about half a wide.

The outer anchorage is sheltered from all winds to the southward of East and West. With two wooded islets, on the West side of the entrance, bearing W. $\frac{1}{2}$ S. distant 1 mile, and the East point N.E. $\frac{3}{4}$ E. 2 miles, the depth is 5 fathoms, sand and shells. The shores are low and fringed with kelp, but the lea dwill be a safe guide, as the water shoals gradually towards the land. The depth on the bar varies from $2\frac{1}{2}$ to 4 fathoms. A vessel can always get an Indian pilot by firing a gun and anchoring for a short time. The inner anchorage, opposite *Kung* village on the western side, just within the narrows is in 10 fathoms, at about 2 or 3 cables off shore. This village has been nearly abandoned for the new *Ya-tza* village on the coast, at about $4\frac{1}{2}$ miles westward of Virago Sound. Above *Kung* village a bank extends off the eastern side of the narrows nearly halfway across, leaving a channel along the western shore, with 7 to 10 fathoms in it.

Naden Harbour.—This capacious and land-locked harbour is about 4 miles in length North and South, and 2 miles in width, with depths of 8 to 12 fathoms in it. Densely wooded low land borders the whole harbour. The S.E. shore has wide tide-flats off it; the N.W. shore is comparatively bold. *Naden River*, entering the harbour at its S.E. corner, is probably the largest river of Queen Charlotte Islands. It flows from a large lake, and at high water a boat can proceed about 2 miles up. *Stanley* or *Te-ka River*, in the S.W. corner, is reported to be navigable for boats. The spruce timber is excellent, and the harbour is well adapted for saw mills and the export of lumber.

From Naden Point, the general trend of the shore is W. by S. for about 17 miles to Cape Knox, the N.W. extreme of Graham Island. The shore and country behind it are generally low; some rocks occur at a little distance off shore, but there is no appearance of a wide shoal-belt like that found East of Masset. *Klas-Kwun Point*, $4\frac{1}{2}$ miles W. by N. from Naden Point, is a remarkable promontory, rising in the centre to a hill about 200 ft. in height,

which is visible for a long distance. In a rocky bay, to the East of the point, is the new Ya-tza village.

About $5\frac{1}{2}$ miles to the S.W. of Klas-Kwun Point is *Jal-un River*, a stream of no great size, but its mouth forms an excellent canoe or boat harbour at high water. At 3 miles further westward is a small promontory, on the East side of which is another excellent boat harbour, and to the West of it is a wide bay, called *Pillar Bay*, from a very remarkable columnar mass of sandstone and conglomerate rock which stands near the eastern side, about 25 ft. in diameter and 95 ft. high, the summit covered with small bushes. It is separated at high water from the shore.

Parry Passage, named after the late Sir E. Parry, separates North Island (which forms the N.W. extremity of the Queen Charlotte Islands) from Graham Island, and is about 2 miles in length, with an average width of three-quarters of a mile. Off the point on the South side of the eastern entrance is a low rock, with a reef covered at high water a little farther out. *Lucy Island*, on the North shore of the passage, is separated from North Island by a narrow passage, the entrance of which, with 8 to 11 fathoms, is between a reef extending off the East end of Lucy Island, and a wide shoal, with kelp, off the South extremity of North Island. Abreast *Tartanne*, the Indian village on the North shore, the depth is 6 fathoms. Ledges of rock run off the southern side of Parry Channel, but there is a good and clear channel between them and North Island, through which the tide rushes and forms a perfect race. On the South side was Chief Edensaw's village, from which he intended removing to Virago Sound. Just within the eastern entrance of Parry Channel, and on the South side, is a bay with anchorage in it.

Bruin Bay, on the South side of the passage and abreast Lucy Island, has anchorage in 12 to 14 fathoms, sand, and may be used as a temporary stopping-place; the flood sets into it forming eddies. The country is low and wooded. On the South shore, at the West end of the passage, is Chief Edensaw's village, now deserted.

On the South side of North Island, and westward of Lucy Island, is a snug cove, called *Henslung*, with high banks and cliffs surrounding it. It is reported that whalers occasionally anchored in it. At the head of the cove is a sandy beach, with a stream of water running down it.

North Island, named by Dixon in 1787, is about 5 miles in length, between North Point and its southern extreme, and composed of low, densely wooded land, no point probably reaching a height of 300 ft. On its eastern side there is said to be a good anchorage in a bay which was formerly often used by the vessels belonging to the old North West Company.

Cloak Bay, the western entrance to Parry Passage, lies between North Island and Cape Knox, and is about $2\frac{1}{2}$ miles wide, with a similar depth. Some rocks, on which the sea breaks only in heavy weather, lie some distance

off the North Island shore, and there are also a couple of remarkable pointed islands on this side. Mr. Dawson states that the East side of North Island affords no good anchorage.

Cape Knox, the N.W. extreme of Graham Island, is a long narrow tongue of land, on which are a few low hills. Its South side is bold, and off it lie several rocks in a westerly direction, the farthest out at a distance of about $3\frac{1}{2}$ miles off the cape, on which the swell seldom ceases to break violently.

On leaving Parry Passage for the westward, get a good offing before hauling to the southward, to clear the rocks off Cape Knox. When well out, the projecting point of Frederick Island will be seen about 18 miles to the south-eastward. At 2 or 3 miles to the southward of Parry Passage is an indentation of the coast, which might be taken as its entrance by a vessel coming from the southward,—a mistake that might lead to serious consequences, as the whole coast, as far as Frederick Island, appears to contain several open bays, with outlying breaking rocks off each of them.

HIPPA ISLAND,* 26 miles S.E. $\frac{1}{2}$ S. of Frederick Island, appears from a position $1\frac{1}{2}$ mile seaward of the latter to be high and bold, but from the South its outer end appears as a low point, and the inner end bold. This portion of the coast is higher and more broken than the former, the openings appearing deeper, neither does it seem to have so many rocks lying off it. The Indians show some good harbours towards Hippi. When abreast Hippi Island, *Point Buck*, 27 miles distant, and also Cape Henry, 18 miles further on, can be seen, the coast presenting the same high and broken appearance as the preceding 26 miles. All the points along this part much resemble Point Buck, which is rather low and rugged, jutting out from the high land at the back.

This coast of the island, as has been before mentioned, is very incompletely known, and at 15 or 18 miles eastward of Hippi Island, Vancouver places the entrance of *Rennell Sound*, so named by Dixon, lat. $53^{\circ} 23' N$. The land appears much broken, and the coast composed of steep mountainous precipices, divided from each other by water. These gradually increase in height in coming southward.

Point Buck, on the North side of the western entrance of Skidegate Channel, has a large high island, *Chalque*, just to the northward of it, and another, much smaller and peaked, standing out clear of the land, at about 3 or 4 miles further to the northward, lying in the entrance of *Cartwright Sound*, which is formed by Point Buck on the South, and Point Hunter on the North.

SKIDEGATE CHANNEL, separating Graham Island from Moresby Island, lies in lat. $53^{\circ} 9'$. The eastern entrance has been alluded to on page 580.

* This island was so named by Dixon, from its being inhabited by a tribe, who fortified themselves precisely in the manner of a *hippa* (o-pah) of the New Zealanders. It is called *Quequets* by the Indians. Mr. Brown believes that native lead is found in the first inlet above Hippi Island, at a place called *Challem*.

The western entrance is about 7 or 8 miles eastward of Point Buck, and is a little over a mile in width. From thence the channel runs in an easterly direction for 6 or 7 miles to *Log Point*, affording no sheltered anchorage. At *Log Point* the West Narrows commence, and about a mile southward of it a branch turns off to the southward and westward, entering the Pacific about 3 miles southward of the main channel, thus forming an island $5\frac{1}{2}$ miles long, and 1,000 to 2,000 ft. high. A vessel might find anchorage in the northern entrance of this passage, but farther in it is blocked by a bank, with not more than 4 ft. on it at high water.

PORT KUPER.—About 9 miles S.E. of Skidegate Channel is a large indentation in the coast of Moresby Island, and nearly filled by *Kuper* or *Kennedy Island*, which has a passage on either side of it, leading to Mitchell or Gold Harbour.

Inskip Channel, which leads round the North side of Kuper Island, was first used by H.M.S. *Virago*, in 1853, and is about $8\frac{1}{2}$ miles long, by half a mile wide. A little without it, there are some small islands on either side, but there can be no difficulty in discovering the passage in. In the channel there is no bottom at 60 fathoms, but at the entrance a cast was got with 35 fathoms, on a halibut bank. At a short distance inside the islands, on the North side of the entrance, is a village belonging to the Kilkite tribe. Further in, on the same side, and about $3\frac{1}{2}$ miles up, is a deep opening, and where this and Moore Channel meet, are two other openings to harbours, with some small islands lying near them. This channel is no doubt equally as safe as the other.

Moore Channel, on the South side of Kuper Island, is named after Mr. Geo. Moore, master of H.M.S. *Thetis*, who made a complete survey of both it and Mitchell Harbour whilst in that ship, which was sent to protect British interest in 1852, during the time that a large number of adventurers from California had collected here to dig and search for gold, some of that metal having been discovered by the Indians. This channel, always used by the vessels which conveyed these people, is 5 miles long in an E.N.E. and W.S.W. direction, and half a mile broad, the shore on each side being bold of approach, high, and covered with trees down nearly to the water's edge. In mid-channel there is no bottom at 70 fathoms. On the North side, just without the entrance, are *Moresby Islands*, some small rocky islets, and on the South side a few rocks close inshore.

Mitchell or Gold Harbour,* or Skiton, is about $2\frac{1}{2}$ miles deep, and half a

* In 1852, the Hudson's Bay Company despatched a party in the brig *Una*, to examine this place for gold, and Mr. Mitchell, who commanded the ship, collected about 1,000 dollars worth of gold, but the Indians stole it as soon as it was blasted, so the expedition broke up. Again in July, 1859, a party under Mr. Downie attempted to find gold here, but decided that further search was useless.—See Captain Mayne's *British Columbia*, pp. 186, 187.

mile wide, surrounded by precipitous and densely wooded hills, from 700 to 800 ft. in height, and at its head, in Thetis Cove, is a sandy beach and a stream of water. At $1\frac{1}{2}$ mile up the harbour is Sansom Island, a small spot covered with trees, and the ruins of a number of huts. The anchorage lies inside this, in *Thetis Cove*, keeping Sansom Island on the port hand; the passage being a cable wide, with deep water. This cove is completely land-locked, but squalls, frequently accompanied by rain, come over the hills with considerable violence. At upwards of half a mile from the mouth of the harbour, on the starboard side going in, is *Thorn Rock*, with only 3 ft. on it at low water, lying about a cable's length from the shore; and on the opposite side, not quite at so great a distance from the land, but a little further out, is another rock. These are dangerous to vessels working in or out; but if the wind be fair, and a ship is kept mid-channel, there is nothing to fear.

Douglas Harbour.—At 1 mile to the westward of Mitchell Harbour, and on the same side of Moore Channel, is the entrance to Douglas Harbour, apparently very similar to the former, from which it is separated by Josling Peninsula. A sailing vessel leaving Moore Channel with a S.E. wind should keep well over towards *Hewlett Bay*, on the South side of the entrance, to enable her to fetch clear of Moresby Islands, as the wind will be very unsteady until well clear of the high land to windward.

TASOO HARBOUR.—*Cape Henry*, which lies 3 miles S.S.W. of the entrance to Moore Channel, terminates in a steep slope, with a hummock at the extremity. At 17 miles to the S.E. by E. of this is the entrance of Tasoo Harbour, the intermediate coast being high, and rising abruptly from the sea. Its entrance is short and narrow, but the harbour itself is extensive, with very deep water in many places. There is anchorage in it, near some small islands on the port hand going in; it has only been visited by a few of the Hudson's Bay Company's officers.

Between Tasoo and Cape St. James, about 60 miles to E.S.E., are other openings, which, according to Indian report, lead into good harbours, the southernmost of which is that leading into Houston Stewart Channel and Rose Harbour. Inside Shangoi Islands, and close to Houston Stewart Channel, is an opening, called by the natives Louiscoon, and reported to be a good harbour, not unlike Rose Harbour. This coast is also apparently very bold, excepting off the Shangoi Islands, and like the previous 17 miles. The land near Cape St. James has fewer trees on it than that to the northward.

Tides.—The following brief account of the tides along the North and N.E. coasts of the islands is given by a Hudson's Bay Company's officer.

The course and strength of the tides are not regular, being greatly influenced by the winds. At full and change they are very rapid. The time of high water is about 12^h 30^m.

In Hecate Strait the flood tide comes from the southward. In Dixon Entrance the flood, coming from the westward round North Island, sets along

the Masset shore across Hecate Strait for Brown Passage, spreading about 15 miles round Point Rose towards Cape Ibbetson (Edge Passage), where it meets the flood from the southward, from Skidegate, Banks Island, and Canal de Principe; consequently between Point Rose, Cape Ball, Cape Ibbetson, and thence S.E. 12 or 15 miles, the tides are very irregular.

The tides between Cape Murray, Point Percy, and Isle de Zayas are the strongest and most irregular, causing a heavy and confused sea, so much so that in bad weather it has the appearance of breakers.

In concluding this account of the coast of this distant British colony, it may be remarked that the wonderful change in its fortunes, and the sudden acquisition of importance to civilization is almost unparalleled. It is, therefore, difficult to keep pace with the progress of a country which, till so recent a period, was only considered fit to be occupied by the trading posts for the purchase of furs.

The nautical descriptions are, however, tolerably complete, and this is also an evidence of the great progress of the times. The southern part of the singular and rugged coasts of this region were for the most part most excellently surveyed and described by Capt. Richards in the *Vancouver Island Pilot*; and the surveys by Staff-Commander D. Pender, in 1864—1870, have added much to our knowledge of the northern portion. Where these authorities are wanting the work of Vancouver is our chief guide; and this work has had but scant justice awarded to its great merit.* Whether the country will rise to be the home of a great and populous nation is a question which may fairly be left to future controversy.

* Besides the excellent narratives of Capt. Mayne and Mr. F. Whympster, which describe many parts of this coast, "The North-west Passage by Land," by Lord Milton and Dr. Cheadle, will, with the others, give a good insight into the early condition of the colonies. "Vancouver Island and British Columbia," by the Rev. Matthew Macfie, F.R.G.S., 1866; "British Columbia and Vancouver Island," by Mr. Duncan G. F. Macdonald, 1862; "Vancouver Island and British Columbia," by Alexander Rattray, M.D., 1862; "Travels in British Columbia, &c.," by E. E. Barrett-Lennard, 1862; may be consulted with much advantage. Mr. Sproat's "Scenes and Studies of Savage Life," are very interesting. As he largely employed native labour at his saw-mills at Alberni, in Barclay Sound, for many years, he had special opportunities for arriving at some remarkable conclusions. There are numerous detached accounts, among which the Description of Vancouver Island, by Capt. W. Colquhoun Grant, F.R.G.S., *Journal of the Royal Geographical Society*, 1857, vol. xxxvii, pp. 268—320, may be specially noticed. Several of the more recent important works have been noticed in various parts of the preceding description.

CHAPTER VIII.

THE COAST OF ALASKA, FROM PORTLAND CANAL TO THE KODIAK ARCHIPELAGO.

THE whole of the north-western Coast of America, from the Portland Canal to the intersection of the 141° meridian with the Arctic Coast, now belongs to the United States. The length of this coast-line has been estimated at 11,270 miles. From the Portland Canal to Mount St. Elias, the highest peak on the continent, in lat. 60° 10' N., the boundary between this territory and British Columbia is fixed at a distance of 30 miles from the coast, and from Mount St. Elias the division is the meridional line carried northward. The area of this territory on the mainland is estimated by the United States' Coast Survey officers at 649,500 square statute miles, of the Aleutian Islands included in the territory 5,630 square miles, and of the other islands 22,260 square miles, together forming a total of 577,390 square miles.

This extensive but comparatively useless region was purchased of the Russian Government by the United States, for the sum of 7,200,000 dollars, *in coin*, the treaty for the transfer being signed on May 28th, 1867. The sum of 200,000 dollars was added to the amount, for the purpose of extinguishing the claims of the Russian-American Fur Company, whose head-quarters were at Sitka, and of an ice-company, established in Kodiak, who had special privileges conceded to them.

The Russian-American Company was established under charter from the Emperor Paul, July 8th, 1799; and the extensive territory in question was granted to them to occupy and bring under the dominion of Russia. The Russian Company and the Hudson's Bay Company were thus brought into collision, and the latter experienced considerable loss in their endeavours to prevent this extension of Russian power. But in justice to Russia it must be said that no country had a better claim to the territory; for as early as 1741, Vitus Behring (a Dane in the employment of Russia), and his companion

Tschirikoff, had touched on the continent in the lat. of 59° and 56° respectively; the former seeing much of the intervening countries, too, on his return; and by 1763 many other adventurers had penetrated eastward as far as Kodiak—and it must be remembered that no other nation claims to have penetrated further North than lat. 53° . In addition to this, Russia had as gradually improved her knowledge by possession as these discoveries advanced, and this, too, not from any jealousy of other powers interfering, as was the case between Spain, England, and France, to the South. Thus the settlement at Kodiak was formed four years before our countryman Meares purchased, or said he did so, his tract of land in Nootka Sound, and Sitka was founded ten or twelve years before Astoria was.

Notwithstanding this, the Hudson's Bay Company expended considerable sums in the establishment of trading posts on the large River Stikine in lat. $56^{\circ} 20'$. The Russians resented by force this procedure of the company, although England claimed the privilege of navigating the rivers flowing from the interior of the continent to the Pacific, across the line of boundary established under the treaty of 1825. The British Government required redress for this infraction of the treaty; and after negotiation between the two governments and the two chartered companies, it was agreed, in 1839, that from the 1st June, 1840, the Hudson's Bay Company should enjoy for ten years the exclusive use of the continent assigned to Russia by Mr. Canning in 1825, and extending from $54^{\circ} 40' N.$ to Cape Spencer, near $58^{\circ} N.$, in consideration of the annual payment of 2,000 otter skins to the Russian-American Company. The boundary between the Russian and English possessions was fixed by the convention agreed to by the respective powers, February 28th, 1825. The charter of the Russian-American Company, granted in 1799, was renewed in 1839, when they had thirty-six hunting and fishing establishments.

Sitka, or New Archangel, founded in 1805, was their chief post. Subordinate to it there was a smaller establishment of a similar kind at Alaska, which supplied one post in Bristol Bay, and three posts in Cook Inlet, all connected with minor stations in the interior. Another station in Norton Sound had its own inland dependencies. The whole of the territory was divided into six agencies, each controlled by the governor-general. The inhabitants of the Kurile and Aleutian Islands, and those of the large island of Kodiak, were regarded as the immediate subjects of the Russian Company, in whose service every man between 18 and 50 might be required to pass at least three years. The natives of the country adjacent to Cook Inlet and Prince William Sound also paid a tax to the company, in furs and skins. The other aborigines in the Russian territory were not allowed to trade with any people but those of the Russian Company.

The political troubles in which Russia was involved some years since, and the probable unprofitable nature of this, their distant possession, led the way

to the quiet transfer of this immense region.* Under its new masters some of its resources will most probably be further developed, but the real value of the territory was the subject of much remark and controversy at the time of the purchase. So little was known of Wal-russia that most vague statements were made respecting it. And as the new régime is of such recent establishment but little can be said here of the social condition of its inhabitants, or of its value to mankind in general.

The one prominent feature which is of most interest in this work is the peculiarity of its climate. In the first edition of this work (1850) the great stream which, like another Atlantic Gulf Stream, passes swiftly along the Japanese Archipelago, was traced for the first time, step by step, up to these shores, and the circulatory system of the North Pacific was shown to be analogous to that of the other oceans. Unlike the North Atlantic, the whole of this eastward drift is carried on to the American coast (as explained in the special Chapter hereafter), one portion along the Aleutian Islands, the other towards Vancouver Island and California. The insignificant portion, which passes through Behring Straits, does not affect the great question. This immense E.N.E. drift brings to the shores of Alaska a enormous quantity of water that is warmer than is due to the latitude. The one great result of this is the wonderful development of animal life, which is the distinguishing feature of the ocean washing it. *It is the greatest fishery in the world.* The accumulated development of ocean-life seems to be drifted on to the coast and into its intricate fiords, as is the case, but in a minor degree, with the Atlantic and the great fishing banks of the Loffoten Islands and the Coast of Norway.

The result of this unbounded supply of ocean-food is that the rivers and fiords teem with salmon to such an extent, that the quantity seems to be incredible, were it not for the universal testimony of all who come here. In the open sea, cod, halibut, and an infinite variety of fish, are to be caught in unbounded quantities. Upon these fish and mollusca, the sea-otter by land, and the whale in the sea exist, and are, at present, the chief objects of profit. Settlements have been made at several places for the carrying on of the fishery. In 1880, 10,000 cases of salmon are said to have been packed.

The climate of the region, too, is subject entirely to this ocean influence. The prevalent S.W. winds, blowing over such a wide area of warmer ocean, bring to the land, and especially near the sea, a vast accumulation of aqueous vapour, which, while it ameliorates the climate, and by its humidity causes vegetation to be of most gigantic growth, makes the climate of Alaska to be so moist, that cultivation would seem to be hopeless. The following summary

* The history of the negotiation, and the steps which led to it, are exhaustively related in a "speech," by the Hon. Charles Sumner, before Congress, Washington, 1867. This is comprised in a closely printed pamphlet, of 96 columns! and gives a resumé of the whole subject as far as was then known.

of *fourteen years* observations at the Imperial Observatory at Sitka will plainly show this relation of temperature and rainfall.

	Temp. Fahr.	Rain. Inches.
Spring (March—May)	41°.3	14.0
Summer (June—August)	54°.3	15.4
Autumn (September—November)	44°.2	30.8
Winter (December—February)	31°.9	22.2
Mean ..	42°.9	Total .. 82.4

The greatest rainfall was 96 inches in 1850; least 58.6 inches in 1861. The yearly average of days upon which rain, snow, and hail fell, or on which fog prevailed, for fourteen years, was *two hundred and forty-five*. These results are from hourly observations.*

At Unalaska, according to Bishop Benjaminoff, the mean spring temperature was 33°.9, summer 49°.6, autumn 37°.5, winter 30°.1; mean for the year 37°.8, or 5°.1 below that of Sitka.

The harbour of Sitka and the adjacent harbours never freeze, and the land ice is unfit for the Californian market, which is supplied from Kodiak. Here the ice forms from 15 to 25 inches each year, so that it is not thicker than that of Boston, U.S., although it is 900 geographical miles further North! a wonderful evidence of ocean climate. Of the whaling grounds we will briefly speak in the next Chapter.† Of its forests, its coal fields and gold regions, we need not say anything—all these matters are yet in their infancy.

It is difficult to get an accurate estimate of the number of the population. In 1836 the number of Russians in the territory of the Company was 730; of native subjects, 1,442 creoles, and about 11,000 aborigines of the Kurile, Aleutian, and Kodiak Islands. In 1868 the population was reported by the military commander to be, 2,000 whites and 60,000 half breeds and Indians; but this latter estimate must be very crude. Sitka is the port of entry. The military force consisted of infantry and artillery, sufficient to garrison the six military posts of Fort Tongas, Fort Wrangel, Fort Koutznou, Sitka, Fort Kenai, and Fort Kodiak.

In 1870, Mr. W. H. Dall estimated the population at about 29,000, of whom about 2,000 were whites and half-breeds. The latest estimate gives about 40,000 natives, and about 500 whites.‡

* In 1879 the U.S. Coast and Geodetic Survey issued a valuable work on the Meteorology of Alaska, containing the results of observations made at numerous stations.

† When the representatives of the Federal Government went to Sitka to receive the transfer of the territory, a body of scientific men accompanied them, and the result of some of their investigations, as given by Professor Davidson, was published in the Proceedings of the California Academy of Natural Sciences, San Francisco, 1867.

‡ Much additional information relating to this territory will be found in Mr. W. H. North Pacific.

The laws of the United States relating to customs, commerce, and navigation, and the establishment of a collection district at Alaska, were extended to the territory by the Act No. 125 of the Second Session of the 40th Congress, passed July 27th, 1868. By the same Act the killing of fur-bearing animals is prohibited, except under regulations prescribed by the Secretary of the U.S. Treasury. By order of General Halleck, August 13th, 1868, the military district is attached to California.

The character of the country, and its trade, &c., will be gathered from the previous remarks and the subsequent imperfect descriptions. A portion of the interior sounds were explored and surveyed by Vancouver, doubtless with his usual accuracy, but of course this occurred before it was colonized by the Russian Company. A Russian chart was published in 1853, which gave many additional details, especially of the western face of the Sitka Archipelago, which was re-surveyed by them. Additions to this chart have been made by the U.S. surveyors, but up to the present time no systematic survey of this coast has been made.

The southern part of this coast, or to as far northward as lat. $58^{\circ} 15'$, is fronted by numerous large islands, similar to the coast of British Columbia, mostly rising in high mountains, and all covered with a dense growth of vegetation. These islands are divided by numerous navigable passages.

The **KOLOSCHENSK ARCHIPELAGO** of the Russians, also known as the *Alexander Archipelago*, is the extensive group of islands which lie between the entrance of the Portland Canal, the boundary of the Territory, and the northern part of the Sitka Islands. Its main features were well delineated by Vancouver's survey in 1792, but in many parts, especially of that which has become the principal part, the Sitka Group, the cursory examination he made is somewhat defective. The Russian and United States officers have made us better acquainted with it, and the King George III. Archipelago of our illustrious navigator is now separated into four or more large islands. The Russian designation is derived from the Indian tribes who inhabit them. These Koloschians, or Kaloshes, have been known in British Columbia as Stikines, and they speak the same language, or at least a dialect of it, as the natives of Vancouver Island and the adjacent continent. Their number is assumed as from 12,000 to 15,000, and they are separated into several families or tribes. Although very much has been done by the settlers in bringing them into a better condition than the primitive savages they were, they must not be trusted.

Dall's valuable work, "*Alaska and its Resources*," and in other works by the same author. Another valuable contribution to our knowledge of Alaska is "*Capitain Jacobsen's Reise an der Nordwestküste Amerikas, 1881—1883*," edited by A. Woldt, 1884. Capt. Jacobsen was sent out to procure ethnographical material for the Royal Berlin Museum. In "*From Fifth Avenue to Alaska*," by Mr. E. Pierrepont, 1884, an account will be found of a voyage along the coast in 1883.

The **PORTLAND CANAL**, forming the boundary, has been described before, pp. 561—568. *Cape Fox* forms the N.W. point of the approaches to it.

TONGAS, the southernmost of the military posts established by the United States on their new territory, is on a small island, one of the Wales Island group, which form the North side of the entrance to the Portland Canal, about $3\frac{1}{2}$ miles N.E. by E. $\frac{1}{2}$ E. from Cape Fox, in about lat. $54^{\circ} 47' N.$, long. $130^{\circ} 44' W.$, and opposite to Port Simpson, which is distant about 17 miles to the E.S.E. The fort, which is garrisoned by one company, is of the usual description, and the primeval forest had to be cleared for the purpose of forming the post. Fish, as everywhere besides, is most abundant. The Tongas Indians, a small tribe of about 500 people, inhabited these islands. The climate here is very damp, this locality being stated to have the heaviest rainfall in Alaska.

From Cape Fox the coast takes a westerly direction 4 miles, and then N.W. $\frac{1}{2}$ N. nearly 6 miles further, to a projecting point called *Foggy Cape*, the coast being very rocky and dangerous. North of Foggy Cape is a large bay filled with a labyrinth of small islands, rocks, and shoals, the north-westernmost and largest being N.W. by W. nearly 3 miles distant.

REVILLA GIGEDO CHANNEL.—Cape Fox on the East, and Cape Northumberland on the West, bearing E. $\frac{1}{2}$ N. and W. $\frac{1}{2}$ S. 15 miles apart, form the southern entrance to the Canal de Revilla Gigedo of Caamano, hereafter noticed. This channel, including Tongas Narrows, may be advantageously used to keep in smooth water, and to avoid the frequent heavy swell setting through Dixon Entrance from the ocean into the South part of Duke of Clarence Strait.

Four miles north-westward of the island above mentioned is the entrance to the *Boca de Quadra*, which is almost rendered inaccessible by islets and rocks. The inlet first takes a direction of N.N.E., to a point 7 miles within the entrance, whence the shores become less elevated, and the inlet takes a S.E. by E. $\frac{1}{2}$ E. direction for 5 miles, and then North for 17 miles to its head, in lat. $55^{\circ} 17\frac{1}{2}'$, a small border of low land, through which flow two rivulets. The sides of this canal are nearly straight, firm, and compact, composed of high, steep, rocky cliffs, covered with wood. Near the entrance, in the Revilla Gigedo Canal, is an islet called by Vancouver *Slate Islet*, a prodigious mass of this stone differing from any other about here. About 5 miles N.W. by W. of the entrance is *Point Sykes*, and N.W. by N. 10 miles farther, is *Point Alava*, and between these points is the entrance to Behm Canal, in which lies Mary Island.

BEHM CANAL, so named after Major Behm, is one of those extensive and singular arms which abound on this forbidding and inhospitable coast. It runs northward for 55 miles, then westwardly and southwardly, encircling the large island of Revilla Gigedo, and this is separated on the S.W. by the

strait of the same name, and Tongas Narrows, from Gravina and Annette Islands.

From *Point Sykes*, the S.E. point of the entrance, the South shore runs N. by E. 10 miles to *Point Nelson*, the inlet being from 7 to 9 miles wide. Eastward of *Point Nelson* an inlet takes a N.E. by E. and North direction for 4 miles, terminating in the usual manner. The surrounding country consists of a huge mass of steep, barren, rocky mountains, destitute of soil, the summits covered with perpetual snow. The shores are nearly perpendicular cliffs rising from the water's edge. The N.E. point of this inlet is *Point Trollope*, 5 miles from *Point Nelson*. In this part of the canal are several islands. North-westward of *Point Trollope* are two long narrow islands on the East side, forming a narrow channel 7 miles long inside of them. Off the N.W. point of the northernmost of these, bearing N.W. about 2 miles distant, is a very remarkable rock, named by Vancouver the *New Eddystone*, from its resemblance to the celebrated lighthouse and rock. Its circumference at its base is about 50 yards, standing perpendicularly on a surface of fine dark-coloured sand. Its surface is uneven, and its diameter regularly decreases to a few feet at its apex. Its height was found to be above 250 ft., lat. $55^{\circ} 29'$.

On the East shore of the canal, 4 miles above the *New Eddystone*, is an unimportant arm, 7 miles in depth. The coast beyond this is straight and compact, trending N.W. $\frac{1}{2}$ N. 8 miles to *Walker Cove*, an inlet extending 6 miles N.E. by N. The main inlet extends in a W.N.W. direction from *Walker Cove*. The water is of a very light colour, not very salt, and the interior country, on the *Island of Revilla Gigedo*, rises into rugged mountains, little inferior in height to those on the eastern side. The shores here are nowhere more than 2 miles apart, and on the East shore, to the northward of the cove, is a cluster of rocks a mile in extent. Proceeding northward, the canal takes a more westerly direction to *Fitzgibbon Point* on the East side, in lat. $55^{\circ} 56'$; and the opposite point, on the island, is called *Point Whaley*.

Burrough Bay extends N. by E. $\frac{1}{2}$ E. from *Point Fitzgibbon* about 6 miles, where it is terminated by low land, through which three or four small rivulets appear to flow over a bank of mud stretching from the head of the arm, and reaching from side to side, on which was lodged a quantity of drift wood. When Vancouver was here, August 11th, 1793, he found the water perfectly fresh, and the whole surface of the bay strewed over with salmon, either dead or in the last stages of existence. They were all small, of one sort, and called by him hunchbacked salmon, from a sort of excrescence rising along the backs of the male fish. In all parts of the inlet, particularly in the arms, and in every run of fresh water, vast numbers of these fish were seen, but all in a sickly condition. If any just conclusion could be drawn from the immense numbers found dead, not only in the water, but lodged on the shores below high-water mark, it would seem that their death takes place immediately after spawning, for the purpose of which they ascend these inlets.

From the mouth of Burrough Bay, the main inlet takes an irregular S.W. by S. direction, to a point on the North shore, nearly 6 miles from Point Whaley, named *Point Lees*. Beyond Point Lees the North shore of the principal channel is formed by *Bell Island*, which is about 6 miles long in a N.N.E. and S.S.W. direction.

The point on the South shore, beyond the West point of Bell Island, is in lat. $55^{\circ} 50'$, long. $131^{\circ} 39'$ (Vancouver, vol. ii, p. 357); and here the channel turns sharp to the southward, and widens in that direction. On the opposite side of the canal is an inlet extending in a westerly direction, for about 4 miles, and to the South of this inlet is a large bay, terminating in a sandy beach nearly all round, its shores moderately elevated and thickly wooded. Off its S.E. point is an island, but no channel inside it. The interior country is not very high, particularly westward, where a low wooded country extends as far as the eye can reach.

Port Stewart, named after one of the mates of Vancouver's ship, is to the S.S.E. of this, its South point of entrance being in lat. $55^{\circ} 38' 15''$ N., long. $131^{\circ} 45'$ W. Here Vancouver remained with his vessel in August and September, 1793. He found it a small but convenient bay, secured, by several breakers, before it, from the wind in all directions. Both excellent water and wood in abundance were found close at hand.

It is formed by a bay in the land, having several islets and rocks lying before it; within these, from the South point of its entrance, it takes a course of N.W. by W. $\frac{1}{2}$ W., about $1\frac{1}{2}$ mile in length and three-quarters of a mile in breadth. In this space it affords good and secure anchorage, in from 4 to 18 fathoms, good holding ground. Towards its head are two very snug coves or basins, one of which is a continuation of the port, the other formed by an indent in the land. The best passage into Port Stewart is between the southernmost isle and the main land; this is perfectly free from any obstruction, with soundings from 4 fathoms at the side to 11 fathoms in the middle. The other passages are not very safe, having several rocks in them.

The eastern shore of Behm Canal, southward of the point where it assumes a southerly direction, is much broken and intersected with arms; and opposite to Port Stewart is a cove near which Vancouver was attacked by Indians, in which two of his men were severely wounded; hence he called it *Traitor's Cove*, and a point to the South on which he landed, in lat. $55^{\circ} 35'$, *Escape Point*.

Cape Caamano, the South point of the peninsula dividing Behm Canal from Clarence Strait, is in lat. $55^{\circ} 29'$ N., long. $131^{\circ} 52'$ W., and was so called after the Spanish commander who first delineated (though imperfectly) these shores.

On the opposite side of the channel, the westernmost point of the island of Revilla Gigedo is called *Point Higgins*, after the then President of Chile, Senr. Higgins de Vallenar, and this latter name is applied to the North point

of the Island Gravina, S. by E. 2 miles from Point Higgins. From two small islands off *Point Vallenar* extends a ledge of rocks, parts of which are only visible at low tide. *Beaton Island* lies to the northward of Point Higgins, against the eastern coast; dangerous rocks lie half a mile off its northern shore.

TONGAS NARROWS, the narrow part of the *Canal Revilla Gigedo* of Señor Caamano, separates, as before stated, the Island, or rather Islands, of Gravina from Revilla Gigedo Island and the main land. It runs W. by S. from between Points Higgins and Vallenar to the southern entrance of Behm Canal, described previously. It was not explored by Vancouver, and Lieut. J. E. Craig, U.S.S. *Alaska*, 1879, states that it is merely outlined on the charts, and very incorrectly, as it is a winding and extremely narrow channel, the navigation of which is only safe with a competent pilot, as there are many hidden dangers, and its sides are bordered by numerous low islets. In some parts the channel is less than a quarter of a mile in width. The current through the narrows is very swift.

Ward Harbour or *Cove* is situated on the East side of the narrows, about 3 miles from the northern end. There are wooded bluffs on each side of the entrance, and on the North side two wooded islets. It appears to be from $1\frac{1}{2}$ to 2 miles deep and about 1 mile wide. The *Alaska* anchored in 6 fathoms, fine brown sand, with the entrance points bearing S. $\frac{1}{2}$ W. and S.W. by S. $\frac{1}{2}$ S.; well sheltered on all sides by high land.

DUKE OF CLARENCE STRAIT separates the Prince of Wales Archipelago on the West from the islands we have been describing on the East, and from the Duke of York and other islands northward, and is probably the opening distinguished in Caamano's chart as the "Estrecho del Almirante Fuentes, y Entrada de Nostra Sen. del Carmin."

Cape Northumberland is the southernmost point of the Gravina Islands, and off it are several clusters of rocks, the bearings of the principal of which, from a tolerably high round island lying about a mile S.E. by S. from the cape, are as follow: the outermost to the N.W., W. $\frac{1}{2}$ N., $3\frac{1}{2}$ miles; the south-westernmost, S.W. $4\frac{1}{2}$ miles; the southernmost, which is the most distant, S.E. by S. $6\frac{1}{2}$ miles; and the south-easternmost, E. by S. $\frac{1}{2}$ S. 5 miles distant. Within some of these the intermediate spaces are occupied by an immense number of rocks and breakers. The southernmost is a round lump of barren rock, always above water, the channel between which and the N.W. and S.E. rocks appeared to have no dangers in it. On the chart two other reefs are marked outside these, the positions of which are doubtful. The one is called the *Devil's Ridge*, and bears 13 miles S. $\frac{1}{2}$ E. of Cape Northumberland; the other is 16 miles to S. by W. $\frac{1}{2}$ W. of the same cape.

Capt. J. C. Brundige, who searched for Devil's Ridge, says, "I found a sunken rock about 4 miles north-westerly of Zayas Island, having only 6 ft. over it at low water. As near as I could judge the reef is not more than 1 acre. I

obtained several good observations and found it to lie with Cape de Chacon bearing S.W. by W.; Gnarled Island, E. by N. $\frac{1}{2}$ N.; and Zayas Island, S.E. by S. $\frac{1}{2}$ S. I have no doubt of this being the Devil's Ridge. I was told by several Hydah chiefs, that there is no other rock or reef in this locality.

"The Indians also informed me that I would find one big stone between Capes de Chacon and Northumberland. We then steered for the place indicated, and saw the sea breaking heavily at about 2 miles off. I approached as near as possible and took the following bearings: Cape de Chacon, S.W. by W.; island off Cape Northumberland, E. by N. $\frac{1}{2}$ N.; small island on the West side of Clarence Strait, N.W. $\frac{1}{2}$ W. The above bearings place this reef 8 miles true North of where it is placed on the chart, marked position doubtful. The breakers appeared to cover a space fully 1 mile in extent." See note on p. 538.

Point Percy lies 9 miles W. by N. $\frac{1}{2}$ N. from Cape Northumberland, and to the E.N.E. of it there appeared to be an opening through Gravina Islands to Behm Channel. It is the western extremity of a long, narrow cluster of low islands, extending about $3\frac{1}{2}$ miles in a N.N.E. direction, nearly uniting to the eastern shore, which is much broken North and South of them. Between this point and Cape Northumberland are several clusters of dangerous rocks, lying in all directions, a considerable distance from shore, and indicated by the weeds growing on them.

Tomgas Harbour.—*Point Davison* bears N.W. by W. $\frac{1}{2}$ W. $2\frac{1}{2}$ miles from Point Percy, and is in lat. $55^{\circ} 0\frac{1}{2}'$ N. Between these points is the entrance to the sheltered basin named Tomgas Harbour, which can also be entered by the channel eastward of the islands, and is about 2 miles in length. At 3 miles N. by E. of Point Davison the channel turns to the N.W. and becomes narrower, but with deep water. Anchorage will be found in about 15 fathoms in the southern part of the harbour.

From Point Davison the coast runs N. by E. towards an opening about 2 miles wide, appearing to divide Gravina Island. In it are innumerable rocks and rocky islets. Northward of this the shores trend N.N.W. 5 miles, and then about N.W. 20 miles to Point Vallenar. The shores of the Gravina Islands are of moderate height, and covered with wood.

The southern entrance to the Duke of Clarence Strait lies between Cape Northumberland on the East, and *Cape de Chacon* on the West. This latter cape is the S.E. point of the Prince of Wales Archipelago, and bears S.W. $\frac{1}{2}$ S. from the former, about 25 miles distant, in lat. $54^{\circ} 43'$, long. $131^{\circ} 54'$. About 3 miles southward of the cape is an extensive reef, on which the sea breaks heavily. Capt. Brundige says the cape should not be approached within 5 miles, except in clear weather.

About 9 miles northward of Cape de Chacon is the entrance to *Gardner Harbour*, a small indentation in the coast, about a mile in extent, in which there is anchorage. The first considerable opening on the western shore of

the strait, North of Cape de Chacon, is *Moir Sound*, which takes a south-westerly direction. From this sound the western shore takes a N.N.W. direction, and forms some bays. The largest of these, situated in lat. $55^{\circ} 8'$, has, in and before it, several smaller islets, the outermost being by far the largest, and as it in many points of view resembled a wedge, it was called *Wedge Island*; off its South point lies a ledge of dangerous rocks. The land in the neighbourhood of *Moir Sound* is high, and rather steep to the sea; but beyond *Wedge Island* the straight and compact shores are more moderately elevated, and the interior country is composed of lofty, though uneven mountains, producing an almost impenetrable forest of pine trees, from the water-side nearly to their summits.

At 8 miles N.W. $\frac{2}{3}$ N. of *Wedge Island* is a projecting point, in lat. $55^{\circ} 16\frac{1}{2}'$, and to the West of this is *Cholmondeley Sound*, which extends to the southward, divided into several branches. Some small islands lie to the N.W. of the entrance. On the eastern side of the entrance was the Russian settlement, *Chasintzeff*, off which there is anchorage.

Point Grindall bears from Cape Caamano S.W. by S. $\frac{1}{2}$ S. about 5 miles distant, with some rocks and breakers extending about a mile northward of it. *Grindall Island* lies about a mile to the N.E. From *Point Grindall* an inlet, named *Casaan Bay*, runs 13 miles W. by S. $\frac{1}{2}$ S., having at its head the fishing station named *Baranovitch*. Here the tide rises about 16 ft.

The strait up to this part varies from $3\frac{1}{2}$ to 11 miles in width; and, with the exception of the dangers immediately adjacent to the shores, is open and clear throughout.

From Cape Caamano to *Point Le Mesurier* the coast first trends W. $\frac{2}{3}$ N., 6 miles, and then N.W. $\frac{1}{2}$ W., 15 miles; about half-way between these points is a small island, with a passage between it and the eastern shore. *Point Le Mesurier* projects from the main land to the westward, and has some islets and rocks extending about a mile from it. Opposite to *Point Le Mesurier* is *Point Onslow*, N.W. by N. $\frac{1}{2}$ N., $5\frac{1}{2}$ miles distant, and between these points is the entrance of an inlet, nearly as extensive as the one it enters, named *Prince Ernest Sound* (after the Duke of Cumberland, afterwards King of Hanover). *Point Onslow* is the South extreme of the island or islands forming the Duke of York Archipelago.

The continental shore from *Point Le Mesurier* trends N. $\frac{2}{3}$ E. to a point 12 miles distant, and is indented with bays. The opposite shores then incline more to the eastward from this point; and 4 miles to the northward of it is the South point of an island thence extending N.W. 5 miles, leaving a tolerably good channel between it and the East shore. At $7\frac{1}{2}$ miles N. by W. $\frac{1}{2}$ W. from the bay within the South end of the island is *Point Warde*, in lat. $56^{\circ} 9'$. The western shore is irregular in its direction, and much broken; opposite the island it is 6 miles distant.

From *Point Warde* the coast takes a sharp turn N.E. $\frac{1}{2}$ N., 4 miles, to a

point where the channel divides into two branches; the easternmost extends N.E. by E. about 10 miles, terminating in the usual way, and named *Bradfield Canal*. The main branch extends in a N.W. by W. direction, 11 miles, to a point in lat. $56^{\circ} 22'$, where it again divides into two branches. This part of the passage is not more than three-quarters of a mile broad, with an island and two islets at the entrance from Bradfield Canal. At the North end the main channel, before which lie several rocks and small islets, is not more than a quarter of a mile wide, extending irregularly to the N.W. and S.W., forming a passage about $3\frac{1}{2}$ miles long to *Point Madan*, where the channel is more spacious, and again bifurcates, one branch trending to S.E. by S. through a broken insulated region, the other stretching to the north-westward, nearly 2 miles wide. In this direction it proceeds about 16 miles to a very conspicuous point, in lat. $56^{\circ} 33'$, named *Point Highfield*, the northernmost point of Wrangel Island, where the channel again appears to divide into two branches, to the N.W. by N. and S.W. Between the North end of Wrangel Island and the small *Simonoff Island*, 4 cables distant, anchorage will be found in 9 to 13 fathoms.

Etoline Harbour is on the western side of the North end of Wrangel Island, 3 miles S.E. of Highfield Point; lat. $56^{\circ} 31' N.$, long. $132^{\circ} 21\frac{1}{2}' W.$

WRANGEL, one of the six military posts of the United States, is pleasantly situated at Etoline Harbour. The scenery around is very fine, backed by lofty snowy mountains. The buildings erected are most substantial, and there is a large Indian village in the immediate vicinity.

Fort Stikine, near the mouth of the river, was originally founded by the Russian-American Company, and in 1842 was transferred to the Hudson's Bay Company, on a lease of 10 years. The establishment, of which the site had not been well selected, was situated on a peninsula barely large enough for the necessary buildings; while the tide, by overflowing the isthmus at high water, rendered any artificial extension of the premises almost impracticable; and the slime that was periodically deposited by the receding sea was aided by the putridity and filth of the native villages in the neighbourhood, in oppressing the atmosphere with a most nauseous perfume. The harbour, moreover, was so narrow, that a vessel of 100 tons, instead of swinging at anchor, was under the necessity of mooring stem and stern; and the supply of fresh water was brought by a wooden aqueduct, which the savages might at any time destroy, from a stream about 200 yards distant.

The apparent opening to the northward of Point Highfield is entirely closed by a shoal extending across it from *Point Rothsay* on the East or continental shore, to *Point Blaquiére* on the opposite side, on the edge of which there is only 6 and 9 ft. water. To the South of this shoal, and in its immediate vicinity, are four small islands and two or three islets; one of the former upon the shoal, and the others, at the distance of $4\frac{1}{2}$ miles from Point Highfield, extend to the

North Pacific.

S.W. of it. This shoal is very steep-to, and, by its connection with the adjoining land, it may be said to make the latter form a portion of the continent.

The **RIVER STIKINE**, Stachine, or *Pelly River*, enters this part of the inland navigation, and has formed the shoal above mentioned, which thus closes its entrance, but it is probable that local enterprise and knowledge will show a useful channel into it. The Stikine empties itself into the ocean by two channels, respectively 4 and 8 miles distant from the fort. The latter is navigable for canoes; while the other, though only in the season of high water, can be ascended by the steamer about 30 miles. Gold has recently been found in this district.

The establishment is frequented by the Secatquonays, who occupy the main land about the mouths of the river, and also the neighbouring islands. Most of these Indians make trading excursions into the interior, in order to obtain furs. Their grand emporium is a village, 60 miles distant from Dease's Lake, and 150 miles from the sea, and thither they resort three or four times a year.—*Sir George Simpson.*

The North shore of the principal arm leading from the mouth of Stikine River now takes a direction of S.W. by W. for 14 miles to *Point Howe*. The shores are indented with small bays, with some small islets; the opposite, or South shore, is about 3 miles distant; and, to the westward of *Point Craig*, lying from Point Howe East, 7 miles, the shore appears firm and compact; to the eastward of it, it is much broken and divided. From Point Howe the shore rounds in a westerly direction to *Point Alexander*, the eastern point of the entrance to *Duncan Canal*, which stretches irregularly N.W. by N. and W.N.W. to its termination in a shallow bay, bounded to the North by a low sandy flat, in lat. $56^{\circ} 58'$. The entrance is formed into two channels by *Woewodski Island*; the easternmost, named *Wrangel Channel*, is a narrow passage running northward into the eastern end of Prince Frederick Sound, with a rock nearly in the centre of its southern entrance. It first trends N.W. by N. for 6 miles, and here it communicates with the more spacious western branch, about 2 miles wide, on the western side of the island, the channel passing South of *Point Hood*, in lat. $56^{\circ} 40\frac{1}{2}'$. From Point Hood, Wrangel Channel trends $4\frac{1}{2}$ miles N. by E. to a low place producing very long grass, passing through broken land, the depth varying from 2 to 6 fathoms. Hence the channel curves in a general N.W. by N. direction, 9 miles, to *Frederick Strait*, its northern entrance.

Point Mitchell forms the S.W. point of Duncan Canal, and is opposite the opening of the southern branch of the Duke of Clarence Strait, the description of which we will resume from the point where Prince Ernest Sound diverges from it.

Point Onslow, as before mentioned (page 600), is the North point of the entrance of Prince Ernest Sound; and from this to *Point Stanhope*, the next projection on the eastern shore of the channel, the distance is 15 miles to W.N.W.,

some islets lying off the intervening broken coast. The coast then extends N.W., about 9 miles, to *Point Harrington*, $3\frac{1}{2}$ miles southward of which is a small island, having on the North side tolerable anchorage, close under the shores of Etoline Island, in *Steamer Bay*. The soundings are irregular, and the bottom is rocky in parts.

Point Nesbitt, the high South point of Zarembo Island, is in lat. $56^{\circ} 13'$, and bears from Point Harrington West about 6 miles, the interval forming the opening to *Stachinski Strait*, which trends northward towards the entrance of Stachine or Stikine River. Off Point Harrington, and nearly in mid-channel, is a cluster of low rocks; and a ledge also extends southward of Point Nesbitt. These seem very dangerous, as most of them are only visible at low water.

Bushy Island, which lies in the channel to the westward of Point Nesbitt, is about 2 miles long, having off its shores, on both sides, some detached rocks, but leaving between it and the eastern shore a navigable channel, extending westward to between *Point Macnamara* on the East, and *Point Colpoys* on the West; the latter bearing W.S.W. 6 miles from the former. Here the channel enters from the north-eastward, as before described, and bears to the westward and southward, through Duke of Clarence Strait, to the ocean. Point Mitchell, the S.W. point of Kuprianoff Island, on the S.W. side of the entrance to Duncan Canal, is the point on the North shore opposite to Point Colpoys, and is 9 miles distant. The northern shore of this branch of the strait extends S.W. $\frac{1}{2}$ W. to *Point Barrie*, a distance of 19 miles. In that space are innumerable rocks; and nearly midway between the two points there is a large bay.

The southern shore forms the North coast of the Prince of Wales Archipelago, and the distance between Point Colpoys and *Point Baker*, its East and West extremes, is 16 miles. Just to the south-westward of Point Baker, which is in lat. $56^{\circ} 21' 30''$, long. $133^{\circ} 33'$, on an islet close to the shore, is an excellent harbour, *Port Protection*, which afforded Vancouver an asylum when he little expected it, amidst impending dangers, in September, 1793.

PORT PROTECTION will be most readily found by attending to the following directions. It is situated at the N.W. extremity of the Prince of Wales Archipelago; its southern extreme comprises the base of a very remarkable barren peaked mountain, named *Mount Calder*, which is conspicuous in many points of view. An islet close to the shore forms the N.E. point of entrance, from whence the opposite point lies South, three-quarters of a mile distant; the channel is good, and free to enter, yet there is one lurking rock, visible only at low tide, lying in a S.S.E. direction from the islet, 3 cables distant; it is clear all round, and indicated by weeds. There is also an irregular bank north-westward of the entrance, with from 15 to 32 fathoms; this, with the meeting of the tides around the Prince of Wales Archipelago, causes an agitation, or race, especially at the flood tide, but there is no danger, the depth being very great.

The harbour takes a general direction from its entrance E. by S. $\frac{1}{2}$ S. for $2\frac{1}{2}$ miles, and its navigable extent is from 5 to 3 cables in width, beyond which it terminates in small shallow coves. The depth is rather irregular, from 30 to 50 fathoms; the shores are in most places steep and rocky, and are covered with an impenetrable forest of pine and other trees. They afford several streams of fresh water; some fish and fruit were found, as also wild fowl. The tides appear to be irregular, but come from the South, and it is high water $7^h 40^m$ after the moon passes the meridian.

Points Baker and Barrie form, as before stated, the western extremes of the branch of Duke of Clarence Strait, which trends E.N.E. and W.S.W. Westward of this the strait takes a southerly direction to the Pacific, and the western shore of this portion is formed by the southern end of an island called *Kou Island* by the Russians, which is singularly intersected by deep bays and inlets, and the shores of which are bestrewn with innumerable rocks, with a narrow channel separating it from the main, so full of rocks and dangers that it certainly is not navigable.

The western shore of the strait bears from Point Barrie in a West direction, but between is *Conclusion Island*, about $3\frac{1}{2}$ miles long, N.W. and S.E. Between Point Baker and Conclusion Island, distant from the former 4 miles, and close to Point Barrie, is a smaller island, low, and about 2 miles long N.W. by N. and S.E. by S., with a ledge of very dangerous rocks extending from its South point. At $2\frac{1}{2}$ miles westward of this is another island, with two smaller ones off its South point. From hence the coast takes an irregular direction about S.E. by S. $\frac{1}{2}$ S. to a point in lat. $56^\circ 17'$, forming the N.E. point of entrance into Port Beauclerc.

Port Beauclerc is of easy access and egress, free from every obstruction but such as are sufficiently evident to be avoided. The opposite point of entrance lies S.W. by S., 2 miles distant; and from the points of entrance it extends N.W. by W. $4\frac{1}{2}$ miles, and S.W. by S. 2 miles. Nearly in the middle is a small island and some rocky islets, and a rocky islet with some rocks lies before its entrance, S.E. by E., $1\frac{1}{2}$ mile from the N.E. point of the entrance. The surrounding shores are in general moderately elevated, and well covered with wood, and water is easily procured.

Point Amelius lies about 3 miles southward of the entrance of Port Beauclerc, and here the coast forms a bay for about 3 miles to the westward, and thence it takes a south-easterly direction, about 6 miles, to *Point St. Albans*, which is a low rocky point, in lat. $56^\circ 7'$, long. $133^\circ 51'$. Off this portion of the coast, islets, rocks, and breakers extend about 3 miles. About 3 miles northward of the point is a snug boat cove.

Afleek Canal extends to the N.W. by N. 15 miles, immediately to the westward of Point St. Albans. Its eastern shore has rocks off it for the first $4\frac{1}{2}$ miles, and then becomes straight and compact to its termination in some low land, through which flow some streams of fresh water. The eastern side

of the canal are mountainous, but not so steep as the interior country. The western side, from half a mile to 2 miles distant, is moderately elevated, and is indented by three large bays in its southern part.

CAPE DECISION, the South extreme of Kou Island, is a very conspicuous promontory, extending in a South direction into the ocean, in lat. $56^{\circ} 2' N.$, long. $134^{\circ} 3' W.$ To S.S.E. of the cape are some islands; the largest, *Coronation Island*, being about 20 miles in circuit. From the N.E. point of this island, which bears S.E. $5\frac{1}{2}$ miles from Cape Decision, is a range of rocky islets extending to N. by W. $\frac{1}{2}$ W., to within $1\frac{1}{2}$ mile of the main land, the space between them and the cape appearing free from interruption.

Cape Pole is the promontory on the western shore of the Prince of Wales Archipelago, which forms, with Cape Decision, 11 miles to W. $\frac{1}{2}$ S., the entrance to the Duke of Clarence Strait. Off Cape Pole is *Warren Island*, which is high; and between it and the cape many lurking rocks were observed. To the southward of it, also, and appearing to extend to a distance of 4 miles from the island, are some clusters of very dangerous rocks. Nearly in mid-channel, between Warren and Coronation Islands, there was no bottom at 120 fathoms.

Although the navigation of Clarence Strait may be free from danger, yet it ought not to be used without much circumspection, as several rocks are marked on the chart.

Of the coast of the Prince of Wales Archipelago we know but very little. From Cape Pole the western shore of the Archipelago trends very irregularly to the E.S.E., and at 6 or 7 miles from the cape is the entrance to *Sachine Strait*, a narrow channel which, running in the same direction for more than 15 miles, insulates what was thought to be the main land of the chief island, and terminates in *Tonook Bay*. The outer coast then trends to the S.S.W. for 20 miles to Cape Addington.

Cape Addington, which appears to be the next most remarkable promontory to the South of Cape Pole, was so named by Vancouver, after the Speaker of the House of Commons. It is very conspicuous, and is in lat. $55^{\circ} 27' N.$, long. $133^{\circ} 48' W.$

Port Bucareli, a very extensive inland sea, lies at the back of and to the south-eastward of Cape Addington. It was discovered by Ayala and Quadra, the two Spanish navigators, who anchored here on August 16th, 1775, and named it Puerto del Baylio Bucareli, in honour of the Mexican viceroy. It seems also to be the same as Sea Otter Sound of Meares, and is formed by several islands. They here took possession, in the name of his Catholic Majesty, of all the country they saw, and all they did not see. The unfortunate La Pérouse also explored it. The tide here rises 13 ft.

Cape San Bartolom is the West point of the entrance of this inland sea, and is in lat. $55^{\circ} 13'$, long. $133^{\circ} 38'$, and is the South extremity of a long, narrow

peninsula, extending in a southerly direction, with some islets off it; it is probably the Cape Barnett of Meares.

The entrance lies between Cape San Bartolom and the West coast of *Suemez Island*, $5\frac{1}{2}$ miles apart. There is anchorage in a bay on the N.W. side of Suemez Island, at 8 miles within the entrance. To the N.E. of this it opens out into a large bay, with many islands. On the N.E. side of this bay is a settlement, called *Kliavakhan*, and to the S.E. it leads to Tlevask Strait, which enters the N.W. part of Cordova Bay.

From Suemez Island the S.W. coast of the Archipelago extends to the S.E. for 27 miles to *Port Bazan*, which is separated into two arms by an island, the anchorage being in the southern arm. *Cape Muzon*, the S.E. point of the Archipelago, is 12 miles to the East. Capt. Brundige states that it is a sharp, barren, bluff point, with deep water close to it, and four small islands on its N.E. side. To the northward of this cape is the entrance to *Kaigahnee Strait*, between Dallis and Long Islands. There are two villages on Long Island, and on the opposite shore is an indentation named *American Bay*. Near here the channel is very narrow at *Howkan Strait*, leading to the South end of *Tlevak Strait*. To the eastward of this, at the South end of Prince of Wales Island, is the extensive bay called *Port Cordova* in the Spanish charts, and is the Port Meares of that commander.

Rasa Isle, or *Wolf Rock*, lying off the mouth of Port Bucareli, is one of the most dangerous impediments to navigation on the exterior coast, and from these circumstances it obtained from Vancouver its latter name. It is a very low, flat, rocky islet, surrounded by rocks and breakers, which extend some distance from it. It lies 13 miles S.E. $\frac{1}{2}$ E. from Cape San Bartolom, $10\frac{1}{2}$ miles from the nearest point of the contiguous shore, and 8 miles N. by W. from San Carlos Island. It was seen by the Spaniards in 1775, who called it *Rasa*, or low. By Capt. Douglas it was called *Forrester Island* in 1786.

San Carlos is a small high island, the South point of which is in lat. $54^{\circ} 48'$, long. $133^{\circ} 30'$. The channel between it and Wolf Rock appears to be free from interruption. It was discovered by Ayala and Quadra, in August, 1775, and by them named *San Carlos Island*. It is called *Douglas Island* by Meares and others, and *Forrester Island* by Dixon and Vancouver, but its real name must be that first applied by the Spaniards. It is very high, covered with verdure, and visible about 50 miles off.

We now return to the northward.

CHRISTIAN SOUND.—Between Cape Decision and Cape Ommaney, which latter is in lat. $56^{\circ} 10'$, long. $134^{\circ} 33\frac{1}{2}'$, and 16 miles distant from the former, is Christian Sound, which forms the southern entrance to a very extensive inland navigation, extending in a remarkably straight direction to N.W. $\frac{1}{2}$ N., through upwards of 3° of latitude, separating a series of large islands from the continent of America. The principal of these are Chatham Strait, leading immediately from Christian Sound to the northward; Prince Frederick Sound,

diverging eastward from it; and Stephens Passage, which branches northward out of the latter. These principal arms insulate the Sitka Islands (or King George the Third Archipelago), Admiralty Island, and numerous subordinate islands, which will be described in due order, commencing with the continental shores. Christian Sound is noticed again hereafter.

From Cape Decision the coast trends N.W. $\frac{1}{2}$ N. about 15 miles to the North point of *Port Malmesbury*. This is about 3 miles deep N. by W., and then 3 miles S.E. by E., and has some islets and rocks in it; notwithstanding which it affords very excellent shelter in from 17 to 34 and 12 fathoms water, and is conveniently situated towards the ocean. The North point, called *Point Harris* or *Garna*, is rendered very remarkable by its being a projecting point, on which is a single hill, appearing from many points of view like an island, with an islet and some rocks extending nearly a mile to the southward of it. At 7 miles farther northward is the South point of a large bay full of innumerable islets and rocks, the N.W. point of which, *Point Ellis*, is in lat. $56^{\circ} 31'$, long. $134^{\circ} 15'$. *Point Sullivan*, which is the next point in the main inlet to the northward, is in lat. $56^{\circ} 38'$, and East of this, also, is an inlet full of rocks and islets. From Point Sullivan the shores to the northward are less rocky, taking a direction of N.W. $\frac{1}{2}$ N. 13 miles, to Point Kingsmill, which is conspicuous.

Point Kingsmill is the S.W. point of Prince Frederick Sound, the opposite point of entrance being Point Gardner, the S.W. extreme of Admiralty Island. This sound extends to the N.N.E. and E.N.E.

PRINCE FREDERICK SOUND.—From Point Kingsmill to Point Cornwallis the bearing and distance are N. by E. $\frac{1}{2}$ E. $6\frac{1}{2}$ miles, the space between being occupied by two bays, each taking an easterly direction, 1 or $1\frac{1}{2}$ mile wide, and 4 or 5 miles deep, and containing many islets and dangerous rocks. The northern bay is named *Saginaw*, and the southern one *Security Bay*. The entrance of the latter is about half a mile wide between the South point and some islands lying on a flat on the North side, and here there is good anchorage in 12 fathoms. Farther in there is anchorage in 10 fathoms, off the village on the North side, and northward of Cleft Island. The tide rises here about 14 ft.

To the eastward of Point Cornwallis are *Kiku Islands* and *Strait*; the West shore of the latter trends to the S.S.E. 9 miles, from the northern Kiku Island, and from this point *Port Camden*, an inlet about $1\frac{1}{2}$ mile wide, runs in a S. by E. direction 12 miles, to within 2 miles of the head of the inlet N.N.E. of Point Ellis, previously mentioned. The shores of Port Camden are pretty free from islets and rocks, but those to the N.W. of it are lined with them, and render the approaching of it extremely dangerous, and its southern extension is perfectly unnavigable for shipping. Coal has been found in a bay on its eastern shore.

The peninsula of Kou Island, which is connected with the more eastern land

by the last-mentioned narrow isthmus, is by no means so high or mountainous as the land composing the adjacent countries on the opposite or north-eastern side of the sound, which at no great distance consists of very lofty, rugged, dreary, barren mountains, covered with ice and snow.

Point Macartney, the N.E. point of Kiku Strait, is a large, rounding, though not lofty promontory, in which are several small open bays, and near it several detached rocks. From hence the shore of *Kuprianoff Island* trends N.N.W. about $3\frac{1}{2}$ miles, where the width of the sound is about 6 miles across in a W.N.W. direction, to Point Nepean. From this station, North, 3 miles distant, lies *Povorotny Island*, a small island, with patches of rock from this point reaching nearly to its shores.

The promontory still takes a winding direction about N.E. 5 miles farther, from whence the southern shore of the sound extends E. by N. $\frac{1}{2}$ N. 17 miles, to the West point of *Perenosnaia Creek*, the only opening in the shore from Point Macartney. This cove extends S.E. about 3 miles, forming a narrow isthmus, 2 miles across, from the head of Duncan Canal (p. 602), another striking instance of the extraordinary insular state of this region.

Point Gardner, as before mentioned, is the S.W. extreme of Admiralty Island, and forms the N.W. point of the entrance to Prince Frederick Sound. To the eastward of the point are two anchorages, both bad in S.E. weather, but good in northerly gales. The one nearest the point is called *Surprise Harbour*, and the eastern one *Murder Cove*, the Indians having murdered some traders here. Off the point, in an E.S.E. direction, lie some rocks and a small island, *Yasha*; the former at the distance of three-quarters of a mile, and the latter 3 miles distant. The coast hence rounds irregularly to *Point Townsend*, a distance of 11 miles; off the intervening projecting points are some rocks. At 6 miles N.E. by N. from this is *Point Nepean*, situated in lat. $57^{\circ} 10'$, long. $134^{\circ} 3'$. It is a high, steep, bluff, rocky point, and off it lies a ledge of rocks about half a mile. At 3 miles to the North of it, on the eastern side, is *Woswodski Harbour*. From this the coast takes a more northerly direction, or N. by E. $10\frac{1}{2}$ miles, to Point Pybus; the coast between is much indented with small bays, and vast numbers of islets and rocks both above and beneath the water. It is in general but moderately elevated; and although it is composed of a rocky substance, produces a very fine forest, chiefly of pine. Northward of this is a large channel, called Stephens Passage. Prince Frederick Sound continues to the eastward and south-eastward.

Cape Fanshaw, which is the point of the mainland opposite, and forming the angle at which the two channels diverge, is low and projecting, but very conspicuous; in lat. $57^{\circ} 11'$, long. $133^{\circ} 25'$. The branch is here 8 miles wide, and its northern shore takes a course E. $\frac{1}{2}$ N., 16 miles, to a low, narrow point of land $2\frac{1}{2}$ miles long, and half a mile broad, stretching to the S.E. by S., called *Point Vandeput*. Here the breadth of the branch decreases to $3\frac{1}{2}$ miles in a South direction, to a steep bluff point; from this part the branch takes a

more southerly course. A shoal extends about a mile S.E. by S. of Point Vandeput. At 8 miles to the N.N.E. of the point is a mountain with a remarkable stone on its summit, named the *Devil's Thumb*. There is anchorage in the bay westward of the point, and on its East side a small bay is formed, from whence the eastern shore trends S.E. 9 miles to another point, off which a shoal extends about three-fourths of a mile. There is a large glacier just above this point. The shore here is a small extent of flat land, lying at the foot of the lofty mountains, which rise abruptly to a great height immediately behind the border. A few miles to the South of this margin the mountains extended to the water-side, when a part of them presented an uncommonly awful appearance, rising with an inclination towards the water to a vast height, loaded with an immense quantity of ice and snow, and overhanging their base, which seemed insufficient to bear the ponderous fabric it sustained, and rendered the view of the passage beneath it horribly magnificent.—(Vancouver, vol. iii, pp. 282-3).

At about 20 miles to the E.S.E. of this, after passing *Souchoi Channel*, the head of the inlet appears closed by a beach extending all round the head of it. At high water this becomes a shallow bank, with an island on it, being the delta of the Stikine River, described on page 602.* At high water it is covered, and by means of this channel an inland navigation for canoes and boats is found from the southern extremity of Admiralty Inlet, in lat. $47^{\circ} 3'$, to the North extremity of Lynn Canal, in lat. $59^{\circ} 15' N.$, long. $135^{\circ} 21' W.$

It was observed by Whidbey, during Vancouver's survey, that in no one instance, during his researches, either in the several branches of Prince William Sound, in those extending from Cross Sound, or in the numerous branches about Admiralty Island, did he find any immense bodies of ice on the islands. He likewise observes, that all the islands, or groups of islands, were land of a moderate height, when compared with the stupendous mountains which compose the continental boundary, whilst the land to the westward of the passage assumed a more moderate height, was free from snow, and produced a forest of lofty pine trees.—Vancouver, vol. iii, pp. 282-3.

STEPHENS PASSAGE, which is over 95 miles in length, opens into Prince Frederick Sound, between Point Pybus and Cape Fanshaw, which are 15 miles asunder; but it should be remembered that its north-western end is rocky, intricate, and very dangerous for shipping in the entrance into Lynn Canal, as hereafter shown.

At $6\frac{1}{2}$ miles N.N.W. from Cape Fanshaw is *Port Houghton*. There is a settlement on the coast, and many rocks line the shores. The South point of

* Prince Frederick Sound was so named by Vancouver after the late Duke of York, on whose birthday his three years' survey of this desolate coast was here brought to a conclusion.

the harbour is *Point Walpole*, near which are some islets and sunken rocks. Its North point is *Point Hobart*, N.W. by N. 3 miles from the other, and from which extends a bank of sand a little distance from the shore, but leaving a clear passage between it and the islets into the port. It extends E.N.E. 5 or 6 miles, and is bounded by lofty mountains, forming the shores of a snug harbour, with soundings of 10 to 6 fathoms a considerable distance from the shore, sand and muddy bottom. It was entered, however, at night, by Commander Meade, U.S.S. *Saginaw*, and he could find nothing less than 80 fathoms close to the rocks, and was forced to go out again. From Point Hobart to *Point Windham* the bearing and distance are N.W. $\frac{1}{2}$ W. 12 miles. Opposite to Point Windham is *Point Hugh*, of Admiralty Island, and here perhaps it may be considered that Stephens Passage more properly begins.

At 3 miles South of Point Hugh is *Point Gambier*, and this latter is North $4\frac{1}{2}$ miles from Point Pybus, previously mentioned. Between the two former points is the entrance to *Seymour Canal*, which extends into Admiralty Island, N.W. by W. $\frac{1}{2}$ W. 29 miles from Point Hugh to its head, in lat. $67^{\circ} 51'$. At its entrance it is from 2 to 3 miles wide, which gradually increases towards its head to 6 miles, and at its termination is a small brook of fresh water. In its northern part are two islands and numerous islets. The adjacent country is moderately high, and covered with timber of large growth, excepting towards Point Hugh, which is a lofty rocky promontory, from whence extends a ledge of rocks, on which the sea breaks with considerable force.

Point Hugh forms the South extreme of a long, narrow peninsula, dividing Seymour Canal from Stephens Passage. The S.W. coast of this passage, which is here about 5 miles in breadth, is nearly straight, compact, and free from rocks or other interruptions up to a high round island lying in the middle of the channel, in lat. $58^{\circ} 3'$, from which the western shore extends N.W. 8 miles to *Point Arden*, where the branch divides into three arms, the principal one directed to the westward.

The eastern shore of the passage, up to this part, is composed of a compact range of stupendous mountains, chiefly barren, and covered with ice and snow, but affording some inlets. From Point Windham, on the South, to *Point Astley*, 10 miles to N.W. by N., the shores are very rocky. The latter is the South point of a deep bay, about 4 miles wide, named *Holkham Bay*. An island lies midway in its entrance, and towards this a shallow bank extends from both sides. Within this are three other islands, and much floating ice was seen within them. The tide here rises about 12 ft. About $2\frac{1}{2}$ miles S.W. of *Point Coke*, its North point, is the southernmost of two small rocky islets, nearly in the middle of the passage; and the eastern shore trends from it N.W. by W. 9 miles to *Point Anmer*, the South point of Port Snettisham.

Port Snettisham first extends about 4 miles from its entrance in a N. by E. direction, where on each side the shores form an extensive cove, terminated by a sandy beach, with a fine stream of fresh water. Northward of *Point Style-*

man, on the N.W. side of the entrance, which is in lat. $57^{\circ} 53'$, long. $133^{\circ} 47'$. is a small cove, in which there is also a run of water, with an islet lying before it. The shores are high and steep, and produce very few trees. From Point Styleman the coast trends N.W. by W. $\frac{1}{2}$ W. 12 miles towards the high round island, before mentioned; this part is much indented with small bays.

Taco, or *Takou*, formerly a Hudson Bay Company's establishment, formed in 1841, is on a little harbour 9 miles from Point Styleman, almost landlocked by mountains, and partially exposed only to the S.E. One of the hills, near the fort, terminates in the form of a canoe, which serves as a barometer. A shroud of fog indicates rain; but the clear vision of the canoe itself is a sign of fair weather. In 1869 the fort was in ruins, and the settlement deserted.

Tako Arm.—Opposite to Point Arden, on the West shore, is the mouth of the arm leading to the N.N.W. from Stephens Passage. Its West point of entrance is *Point Salisbury*; about 3 miles N.E. of this is the settlement of *Takou*, off which there is anchorage, and it extends about N.N.W. 13 miles, when the shores spread to East and West, and form a basin about 4 miles broad, and 6 miles long, East and West, with a small island lying nearly at its N.E. extremity. From the shores of this basin a compact body of ice extended some distance nearly all round at the time of Vancouver's visit; and the adjacent region is composed of a closely united continuation of the lofty range of frozen mountains, exhibiting as dreary and inhospitable an aspect as the imagination can possibly suggest. The rise and fall of tide here were very considerable, appearing to be upwards of 18 ft.

The River *Taco* or *Takou*, falling into the gulf to which it gives its name, according to Mr. Douglas, who ascended it about 35 miles, pursues a serpentine course between stupendous mountains, which, with the exception of a few points of alluvial soil, rise abruptly from the water's edge. In spite of the rapidity of the current, the savages of the coast ascend it 100 miles in canoes. The tribes who live on the coast between this and Port Houghton are known as the *Sundowns* and *Takos*, and are treacherous and mostly hostile, numbering about 500.

From Point Arden, Stephens Passage takes a general course of W. by N. $\frac{1}{2}$ N., and is about 3 miles in width. About 15 miles along the South shore is *Point Young*, forming the East point of *Auke Harbour*. From here the width of the arm decreases to about 1 mile, and the South shore stretches W. $\frac{1}{2}$ N. 7 miles to another cove with an islet lying near it. At $4\frac{1}{2}$ miles N.W. by N. from this cove is the West point of *Douglas Island*, so named after the then Bishop of Salisbury, and forms the North side of this portion of the passage. It is about 20 miles long, and 6 miles broad in the middle, and separated from the continent by a narrow channel, named *Gastineaux*, nearly always impassable from the ice. About 7 miles from the entrance of this passage, on its East side, is the mining town of *Juneau* or *Harrisburg*, where many gold ledges have been discovered. Gold has also been found on *Douglas Island*, and in the

same neighbourhood there is stated to be a large deposit of silver ore. The North-West Trading Company had a store here in 1883.

To the W.N.W. of this part is a rocky and intricate portion of the passage, very dangerous for the navigation of sailing ships, so that the communication between it and the large channel to the N.W. and West of it is impeded. It is, however, navigable for steamers.

At the N.W. extremity of Douglas Island is *Fritz Cove*, in lat. $58^{\circ} 19' N.$, long. $134^{\circ} 47' W.$ The shore at the middle of the cove is low, and just back of the beach it is marshy. *Entrance Point*, the North point, is about 75 ft. high, and covered with trees. There is anchorage southward of this point, in 12 fathoms, formerly used by the Hudson Bay Company's steamers. The holding-ground is good, being sticky mud. The rise and fall of the tide observed was 14 ft. Shoal water appears to extend $1\frac{1}{2}$ cable off the shore.

The channel beyond the N.W. point of Douglas Island is divided into two branches by *Shelter Island*, a very narrow island, about $\frac{1}{2}$ miles long, and half a mile broad. The passage on its N.E. side may be considered as next to impassable for shipping without a pilot, by the rocks and islets at its S.E. end. *Saginaw Channel*, the other passage, is equally unsafe and intricate, from the same cause, but is safe for steamers. The *Saginaw* passed through without a pilot in March, 1869, and without any trouble. A reef, lying about three-quarters of a mile westward of the S.E. end of Shelter Island, is the only known hidden danger.

To the S.S.W. of the North end of the above island is *Point Retreat*, the northernmost point of Admiralty Island, in lat. $58^{\circ} 23'$, long. $135^{\circ} 0'$, and having a reef extending one-third of a mile W. by N. from it. About 3 miles westward from Point Retreat, in the southern channel, is a deep cove, *Barlow Cove*, which, with Shelter Island lying before it, forms a very snug harbour, of good access by the passage round to the North of Point Retreat, as the rocky part of the channel lies to the East of it. To the West of Point Retreat and Admiralty Island is that extensive branch named by Vancouver after the nobleman, Chatham Strait, to the South opening of which we will now return.

CHATHAM STRAIT.—Cape Decision, the S.E. point of entrance, has been before described (page 605). It was so named by Vancouver, from his having so far decided that the great openings stated to exist by De Fonte, De Fuca, and others, did not exist—a conclusion he was scarcely warranted in making, inasmuch as a more careful attention to their narratives shows some truth, although much alloyed with the fabulous.

The other point of entrance is Cape Ommaney, the South extremity of the Sitka Archipelago; it was so named by Capt. Colnett. Off it lies an islet called *Wooden Rock*, from one of Vancouver's men having been drowned here.

The opening between Capes Ommaney and Decision was named by Colnett Christian Sound, and off the opening is a group of small rocky islets, about 3 miles in extent, called *Hazy Islands*. They lie S.E. $\frac{1}{2}$ S. 15 miles from Cape

Ommaney, S.W. by S. $\frac{1}{2}$ S. 14 miles from Cape Decision, and 8 miles W.S.W. of Coronation Island, which is the nearest land to them.

The eastern shore of the strait, from its southern point to the entrance of Prince Frederick Sound, has been before described (p. 607). *Point Gardner*, the North point of its entrance, is also the southern extremity of Admiralty Island.

From Gardner Point the eastern shore of the strait runs about N.W. $\frac{1}{2}$ N., $13\frac{1}{2}$ miles, to a sharp point, north-eastward of which is the entrance to *White Water Bay*, an inlet extending $3\frac{1}{2}$ miles East, the water shoaling to 5 fathoms near its head. On the North side of the entrance is a village, and about $1\frac{1}{2}$ mile southward of the southern point is the dangerous *Russian Reef*.

Between the North point of the bay and *Hood Bay*, about 9 miles to N.W. by N. $\frac{1}{2}$ N., the shore is indented by two bays. *Hood Bay*, which is about $4\frac{1}{2}$ miles across to *Point Saginaw*, has some islands nearly in its centre, and on its North side is *Kenasnow Island*, $3\frac{1}{2}$ miles long E. by N. and W. by S., with a reef extending off each end. On the North side of this island are *Kootznahoo Roads*, from whence there is communication with *Koteosok Harbour*, at the North end of Hood Bay, by means of a narrow channel, with $4\frac{1}{2}$ to 5 fathoms water in it, between Point Saginaw and the island. The approach to this harbour from Hood Bay has some islets and rocks in it, and was not examined. On the East end of *Kenasnow Island* a trading post has lately been erected.

KOOTZNAHOO or *Kushnou* is an Indian settlement, about $1\frac{1}{2}$ mile E.N.E. of Danger Point. The tribe of Indians which gave it the name were about 800 in number, and had a bad reputation. Opposite the village is a large bank of shoal water, separating it from the roads, and within this there is anchorage in 12 fathoms off the village. *Saginaw Point*, $1\frac{1}{2}$ mile to S.E. by E., is the proposed site of a fort.

Danger Point, the North point of the roads, has a reef extending about a mile to N.W. of it, and is in lat. $57^{\circ} 29' N.$, long. $134^{\circ} 36' 50' W.$ Northward of it is the entrance to a narrow but extensive inlet, which runs in a N.N.E. direction for about 12 miles, from which position a passage for canoes is reported to exist into Seymour Channel, and thus separating Admiralty Island into two peninsulas. This part is known as the *Kootznahoo Archipelago*. In the entrance of the channel, northward of Danger Point, there is a depth of 10 fathoms, and about 4 miles within is *Stillwater Anchorage*. About 9 miles above this, on the South shore, are some coal mines.

At 3 miles N.W. of Danger Point is *Samuel Point*, and at 7 miles farther is *Point Parker*. The coast is indented into several small bays; the shores are low, and much divided by water. Beyond this, still following the same direction for 28 miles, is *Point Marsden*, off which are some rocks. The land is very moderately elevated, covered with fine timber, chiefly pine, and terminating at the water-side with alternate steep rocky cliffs and small sandy bays, with a

few detached rocks near it. Hence to *Point Retreat*, which is the North extremity of Admiralty Island, before mentioned (p. 612), the distance is about 17 miles, the coast being nearly in the same direction, and of the same character, as that more to the South.

ADMIRALTY ISLAND.—The shores of Admiralty Island, which have thus been imperfectly described, are about 180 miles in circuit. With the exception of its N.W. and S.E. parts, they are very bold, affording many convenient bays likely to admit of safe anchorage, with fine streams of fresh water flowing into them, and presenting an aspect very different from that of the adjacent continent, as the island in general, except at its N.W. end, is moderately elevated, and produces an uninterrupted forest of very fine timber trees, chiefly of the pine tribe; whilst the shores of the continent, bounded by a continuation of those lofty frozen mountains which extend south-eastward from Mount Fairweather, rise abruptly from the water-side, covered with perpetual snow, and their sides are broken into deep ravines or valleys, filled with immense mountains of ice. Notwithstanding that the island seems to be composed of a rocky substance covered with little soil, and that chiefly consisting of vegetables in an imperfect state of decay, yet it produces timber which was considered by Mr. Whidbey to be superior to any he had before noticed on this side of America. The ocean hereabouts, too, encroaches most rapidly on the low land. The stumps of trees, in various stages of decay, still standing erect, are to be found below high-water mark, and many of the low shores, now covered with the sea, produced, at no very distant period, tall and stately timber.

LYNN CHANNEL.—The entrance of this inlet is between Point Marsden and *Point Couverden*, 7 miles to W. by N. $\frac{1}{4}$ N., and from thence it extends 60 miles in a N.W. by N. direction, branching off at its head into Chilcoot and Chilcat Inlets. Lynn Canal was first made known and surveyed by Vancouver's party, under Mr. Whidbey, in July, 1794, and was named by the commander after his native town in Norfolk.

In 1880, the officers of the U.S.S. *Jamestown* made a reconnaissance of Lynn Channel, and the information thus gained is inserted in the following description, but the chart will prove the best guide.

It receives a river, the Chilcat, which the Indians are stated to ascend about 60 miles to a valley running towards Mount Fairweather, and containing a large lake, which pours its waters into the open ocean at Admiralty Bay. The natives of this valley are called Chilcat or Copper Indians, from the abundance of virgin copper in the neighbourhood. Both sides of the arm are bounded by lofty, stupendous mountains, covered with perpetual ice and snow, whilst the shores in the neighbourhood appear to be composed of cliffs of very fine slate, interspersed with beaches of paving-stone. The channel varies from 4 to 8 miles in width, and has deep water throughout.

Near the junction of the waters of Lynn Channel, Cross Sound, and Chatham Strait, is *Hanus Reef*, a large reef lying 3 miles S.E. by E. $\frac{1}{4}$ E. from Point

Couverden, and at low water the highest part was 7 or 8 ft. out of water. It consisted of a series of detached rocks extending at least a quarter of a mile to the eastward of the position occupied. A vessel must not approach this reef nearer than a mile, for a strong 2 or 3-knot current sets right across it.

In the southern part of the inlet are several islands and islets. At the North end of this group is *Vanderbilt Reef*, lying in mid-channel, which must have a good berth given to it. It lies about 3 miles S. $\frac{1}{2}$ E. from *Bridget Point*, the South point of Berners Bay.

Favorite Channel leads to the S.E. by E. towards Stephens Passage. In the course through this channel, entering from the northward and westward, keep well over towards Point Bridget to clear Vanderbilt Reef, until a S.E. $\frac{1}{4}$ S. course will take you through in mid-channel between Lincoln and Sentinel Islands. The sunken rock laid down on the old charts near Shelter Island, in this channel, may exist, but Lieut. Symonds, U.S.S. *Saginaw*, passed at low water very near, if not over its position, in a steamer drawing 11 ft. of water.

The channel was found to be clear until George Rock was reached. When passing to the eastward of this rock, keep well over towards Spuhn Island after passing Point Louisa. Fritz Cove, where there is anchorage, was described on page 612.

Berners Bay is a large indentation on the eastern shore, about 4 miles across in a S.S.E. direction, and about 5 miles deep to the northward. *Point St. Mary*, in lat. $58^{\circ} 42' N.$, forms the North point of the bay, and from thence the eastern shore of the inlet trends in a compact manner to the N.W. by N.

William Henry Harbour.—At 7 miles W. by S. $\frac{1}{4}$ S. of Point St. Mary, and on the opposite side of the channel, is the eastern point of this excellent harbour. To enter it, keep from one-half to three-quarters of a mile from the western shore until abreast the entrance. This is necessary, as otherwise it is very difficult to recognise the harbour. Strangers will be aided in finding it by noting that the highest mountain in this vicinity, which has a rounded, bald top, without trees, is just to the northward and westward of the entrance. When the bay has opened well, head in for the inner part, and select a berth at pleasure in from 9 to 13 fathoms, muddy bottom. Wood and water can be obtained here. There is a wood dépôt on the West side of the bay. About $3\frac{1}{2}$ miles N.W. by N. from the East point of the bay is *Endicott River*, the mouth of which is filled with sand bars.

About 6 miles northward of Endicott River is the South end of *Sullivan Island*, with an islet about half a mile off it. The channel between the island and the western shore averages about $1\frac{1}{2}$ mile in width, but at its southern end a shoal extends nearly from side to side. Sullivan Island is about 5 miles long and 1 mile broad, and northward of it the inlet diverges into two branches.

Seduction Point is the South extremity of a peninsula, consisting of a narrow

strip of land, 1 or 2 miles across, dividing Chilcat and Chilcoot Inlets. Reaching for 2 miles S.E. of it are the *Chilcat Islands*.

CHILCAT INLET, the western arm, trends 11 miles W.N.W. from Seduction Point, and then becomes blocked by flats, bare at low water, extending from side to side. About midway up lies *Ventosa Island*, and 2 miles farther on is *Pyramid Islet* in mid-channel, bare of trees, and sandy.

Pyramid Harbour, on the S.W. shore of the inlet, bears S. $\frac{1}{2}$ W. from Pyramid Islet. To reach it, when abreast Seduction Point keep about mid-channel, giving the preference to the N.E. shore, as flats are said to make out from the opposite side. After passing *Ventosa Island*, haul over for the western shore, and you will be aided in recognising the harbour not only by Pyramid Islet, but by the old bed of a glacier, which will appear like a sand-spit, just to the southward of the anchorage. Haul in for the bight, and approach the shore boldly, anchoring in from 11 to 15 fathoms, soft mud, excellent holding ground. There is a village 4 miles above the harbour.—*Master G. C. Hanus, U.S.S. Jamestown*, 1880.

A short distance above Pyramid Island commence the flats and shoals in the mouth of Chilcat River. In May, 1880, Lieut. McClellan, U.S.S. *Jamestown*, searched ineffectually for several hours for a channel suitable for a launch drawing about 3 ft. It is dangerous for any vessel to go beyond Pyramid Islet without a local pilot. Above Pyramid Islet the water is perfectly fresh, and from the edge of the shoal limiting the navigation the North shore is distant 3 miles, and through a small opening a rapid stream of fresh water rushes over the shoal.

Tondustek is an Indian village on the North shore of Chilcat Inlet, about 4 miles N.W. by N. of Pyramid Islet. When visited by Lieut. Symonds, U.S.S. *Jamestown*, in 1880, the population amounted to 171 Indians. The village is on a wide, grassy, alluvial flat, having for its background a bold granite mountain, whose precipitous peak was streaked in a remarkable manner by slides of bright slaty granite, sand, and gravel.

Chilcat River.—Lieut. Symonds ascended this river in a canoe. After leaving the village a course was shaped up the river against an opposing current of at least 4 miles an hour.

The course from the village was S.W., and at 2 miles from it precipitous wooded mountains, 2,000 ft. in height, rose on either hand. On the S.E. side of the river are seen rugged and serrated mountain crests, covered with snow. About 5 miles S.W. by S. from Tondustek, up the valley of a stream called *Takheen* or *Hindmost River*, is the *Bertha Glacier*, resting on a southern mountain slope, and reaching nearly to the surface of the river. At $2\frac{1}{2}$ miles farther on the course was altered to West, around *Spuhn Point*, where the river is $1\frac{1}{2}$ mile wide. Sand bars just awash were continually met, and the average depth in the channel was only 2 ft.

Above *Vanderbilt Point*, which bears West $2\frac{1}{2}$ miles from Spuhn Point, the mud and sand flats, which fill the lower part of the river, were left behind, and numerous low flat islands were met with, covered with trees. The current is rapid, and increases in proportion as the channel between the islands narrows, running at times 5 or 6 miles an hour. The average width of the river was here 1 mile. *Kutkwuthu* village, 6 miles above *Vanderbilt Point*, had a population of 125 Indians. From *Camp Point*, half a mile S.E. of this village, the North bank trends 3 miles to the W. by N. to *Chilcat Point* and *Klukquan* village, where the river is 2 miles wide, and was alive with salmon. The cliffs on the banks are about 2,000 ft. in height. The village contained a population of 558 Indians.

Above this village is the *Taheen* or *King Salmon River*, which was entered after rounding *Chilcat Point*. Nearly West of *Klukquan* village is a point, on which is *Chileat Peak*, 4,000 ft. high, where the *Taheen*, flowing from W.N.W., and the *Kluheeny* or *Dog-salmon*, from S.W. by W., meet.

From every indication on the banks of the *Chileat River*, *Lieut. Symonds* concludes that, during the spring and summer freshets, the river never rises more than 2 ft. above its level in September, which rarely exceeds 3 ft. in the deepest part of the main channel.

CHILCOOT INLET is the eastern arm from the head of *Lynn Canal*. It trends about 13 miles N.W. from abreast *Seduction Point*, and varies from $1\frac{1}{2}$ to $2\frac{1}{2}$ miles in width, terminating in low land, formed immediately at the foot of high stupendous mountains, broken into deep gulleys, and loaded with perpetual ice and snow. Near its head, on the West shore, is *Portage Bay*, where the N.W. Trading Company have established a station, so named from the canoe-portage, $1\frac{1}{2}$ mile in length, across the low peninsula to *Chilcat River*. The trading post is about $2\frac{1}{2}$ miles from *Tondustek* village, and a Presbyterian Mission was proposed to be established here.

To reach *Portage Bay*, when abreast of *Sullivan Island* haul over for the N.E. shore of *Lynn Canal*, keeping about mid-channel until you open the bay. Keep about a quarter of a mile from the South shore of the bay, and anchor near it in from 9 to 15 fathoms water, muddy bottom.

Above *Portage Bay* two rivers enter the head of the inlet. *Deyea River*, the western one, is shallow, and is the outlet of *Chilcoot Lake*. The village of *Tananeis*, having 127 inhabitants in 1880, is at the junction of the river and lake, about 4 miles from *Portage Bay*. *Tyga Inlet* enters the eastern side of the inlet, and extends in a northerly direction to a shallow river of the same name. There is reported to be plenty of water and good holding ground in *Tyga Inlet*.

THE SITKA ARCHIPELAGO.

The land forming this collection of islands, named by Vancouver King George III. Archipelago, was first discovered by Alexoi Tschirikow, the second in command of the expedition under the unfortunate Behring, in 1741. This was their third voyage, and they were separated by a storm soon after they had set out on their voyage. Tschirikow directed his course to the East, from the parallel of 48°, and, towards the middle of July, made the land of America, between the 55th and 56th parallels; but others place his landfall in 58°. The coast which he found was steep, barren, guarded by rocks, and without a single island that could afford shelter. He anchored off the coast, and detached his long-boat, with orders to put on shore wherever she could land. Several days elapsing without her reappearing, he despatched his other boat to gain tidings of her, but the latter no doubt experienced the same fate as the former, and it is unknown what became of either. Some canoes, manned by native Americans, presented themselves a few days after, to reconnoitre the ship, but they durst not approach her, and there remained on board no boat of any sort that could be detached to join or pursue them, and prevail on them to come to the ship, where they would have been detained for hostages. Tschirikow, despairing to see again the men whom he had sent on shore, resolved to quit the coast, and accordingly returned to Kamchatka. These discoveries became known to France and Europe from the fact of Delisle de la Croyère, one of the brothers of the French savans, and Dr. Steller, the naturalist, having accompanied Tschirikow. Such was the first authentic discovery of North-West America, which arose out of the original plans projected by Peter the Great, and subsequently carried into effect by the Empress Catharine. It has since been called the Sitka Archipelago, from the tribe of Indians who inhabit it.

The land in question, like Vancouver Island and others to the southward, was then supposed to form part of the American continent; and it was not until Vancouver's expedition that Chatham Strait was discovered, and thus showed the real nature of the land on the Pacific. Vancouver, too, as will be seen from the preceding remarks, did not very minutely examine the western shore of the strait to which he gave the name of his vessel, but just inferred that it was penetrated by one or more channels leading to the open ocean, from the fact of some of the natives being found in the strait who belonged to the other side of the islands.

Capt. Urey Lisiansky, of the Russian navy, examined the group in 1805, and, by his survey, it appears that it consists of four principal islands, viz., Jacobi, Kruzoff or Crooze, Baranoff, and Chichagoff.

Although Vancouver examined the channels to the eastward of it, and the Russians and Americans have surveyed, partially, the western coast of the

chief island, yet our acquaintance with its physical characteristics is still very limited.

BARANOFF ISLAND is the southernmost, and is about 85 miles in length, by about 20 miles in its maximum breadth. On its West side is Sitka or Norfolk Sound, the principal place of resort in these seas, and the situation of the head-quarters of the former Imperial Russian Company, and now a settlement of the United States.

KRUZOFF or *Crooze Island*, the South extremity of which is formed by Cape and Mount Edgecumbe, lies before Sitka Sound, and was so named by Capt. Lisiansky, after the Russian Admiral. It is $18\frac{1}{2}$ miles in length, and separated from Baranoff Island by Neva Channel. At its North extreme is Klokacheva Sound, Olga Gulf, or the Bay of Islands, which leads to Pogibshi Channel, separating the two principal islands of the group, called by Lisiansky *Pagobnoy* or *Pernicious Strait*. It joins Chatham Sound, is deep, and derives its name from a party of Aleutians having been poisoned there some years previously by eating mussels. Kruzoff Island is called Pitt Island in La Pérouse's and some other early charts.

CHICHAGOFF ISLAND is the next and northernmost large island, and is about 60 miles in length. It is divided from Baranoff Island by the strait previously mentioned, and extends from it to Cross Sound, which separates it from the continent to the northward.

Jacobi Island, the fourth of those described by Lisiansky, lies at the N.W. extremity of Chichagoff Island, and is about 10 miles in length. The narrow passage separating them was not explored by Lisiansky.

These islands are all well wooded, chiefly pine, larch, and cedar. The rivers abound in excellent fish, and herrings swarm in the sounds every spring, with fine cod and halibut at all seasons. The climate allows the growth of European grain and vegetables, the summer being warm. The natives are described as brave, but extremely cruel.

CAPE OMMANEY, in lat $56^{\circ} 10'$, long. $134^{\circ} 33'$, is the South extreme of the archipelago, and off it lies *Wooden Rock*. They have been alluded to before, on page 612, as forming the S.W. entrance point of Chatham Strait.

Port Conclusion.—At 6 miles N. $\frac{1}{2}$ W. from Cape Ommaney, on the eastern coast of Baranoff Island, is the southern point of the entrance to Port Conclusion, so called because it was here that Vancouver's vessels awaited the conclusion of the survey of this coast in August, 1794, having left England on the 1st of April, 1791, for that service. The North point of Port Conclusion bears from the southern N.W. 2 miles distant, and the depth of water in mid-channel, between them, is 75 fathoms, but decreasing to 8 or 10 fathoms close to the shores, without rocks or sands, except near the points. From its entrance to its head the port extends about 3 miles South, free from any interruption, although it is inconvenient from its great depth of water. The soundings cannot be considered as very regular, yet in general they are good, in some places

stony, in others sand and mud; but in the cove, where the vessels were at anchor, $1\frac{1}{2}$ mile within the South point on the other side, the bottom is rocky. The head of this cove approaches within one-fourth of a mile of the head of *Port Alexander*, another cove, whose entrance on the outside is about 2 miles to the South of the South point of the harbour, and has a depth of 7 fathoms in it, with weeds growing across.

Port Armstrong, about half a mile S.W. from the North point of entrance, is a most excellent and snug basin, about a mile long, and a third of a mile wide; but its entrance is by a very narrow but deep channel, half a mile in length, in a S.W. direction, with some islets and rocks lying off its South points; these are steep, nearly close to them, as are the shores on both sides, which vary from a sixth to a twelfth of a mile asunder, with a clear navigable passage from 8 to 12 fathoms deep in the middle, and 5 fathoms on the sides. The soundings are tolerably regular in the basin, from 30 fathoms in the middle to 10 fathoms close to the shores. Immediately within its North point is a fine sandy beach, and an excellent run of water, as is the case also at its head.

The western shore of Chatham Strait was not minutely surveyed by Vancouver's party. It follows a nearly straight direction from Port Conclusion, about N.W. $\frac{1}{2}$ N. for 105 miles to *Point Augusta*, in lat. $58^{\circ} 34'$, long. $134^{\circ} 58\frac{1}{2}'$, preserving a nearly parallel direction to the opposite side, which varies from 5 to 9 miles distant.

This extensive arm, as far as was ascertained, is very free from danger, and probably affords many places of refuge. The flood tide, although of short duration, running not more than two hours, was regularly observed to come from the South.* To the northward of *Point Augusta* the western shore diverges more to the westward, while the eastern side beyond *Port Marsden* still preserves the same direction. Into the opening thus formed a peninsula of the mainland projects to the southward, thus dividing it into two channels, the principal being to the N.W., while that which continues on in a North or West course is called *Lynn Canal*, previously described.

At 37 miles below *Point Augusta* is the entrance of *Pogibshi Channel*, on the North side of which some reefs extend a long distance from the shore, and are described hereafter. *Sivash Channel*, 17 miles below *Point Augusta*, is said to be only navigable for canoes; just to the northward of its entrance is a

* Mr. Whidbey considered that Chatham Strait was likely to be one of the most profitable places for procuring the skins of the sea-otter on the whole coast, not only from the abundance observed in the possession of the natives, but from the immense numbers of these animals seen about the shores in all directions. Here the sea-otters were in such plenty that it was easily in the power of the natives to procure as many as they chose to be at the trouble of taking. They were also of extremely fine quality.—(Vancouver, vol. iii, p. 264). Commander Meade, U.S.S. *Saginaw*, reports that in 1869 the otters had disappeared from this strait.

large opening named *Freshwater Bay*, on the West side of which is *Wachusett Cove*, with a depth of 9 fathoms in it.

Point Couverden, the South extremity of the above peninsula, is in lat. $58^{\circ} 12'$, long. $135^{\circ} 4'$, and was so named after the seat of Vancouver's ancestors in Holland. The continental shore in this neighbourhood constitutes a narrow border of low land, well wooded with stately trees, chiefly of the pine tribe, behind which extends a continuation of the lofty snowy mountains. About half a mile S.E. of Point Couverden is an islet, and $1\frac{1}{2}$ mile N. by W. of the point is one small island, the outermost of three or four rocky islets extending in a line from the shore. Beyond this the western shore of the arm is firm and compact, indented with a few coves, and some islets and rocks lying near it. The eastern shore, described on pp. 614—615, presents a broken appearance. *Hanus Reef*, 3 miles S.E. by E. $\frac{1}{2}$ E. from Point Couverden, was also there described.

Swanson Harbour, about 3 miles westward of Point Couverden, is sheltered by Ansley Island. It can only be entered from the East, the course from the rocky islet off Point Couverden being about West. Off the S.E. point of *Entrance Island*, which lies off the East end of Ansley Island, a reef makes off a quarter of a mile or more; after passing these, steer about West for the centre of the inner end of the harbour, and anchor opposite the western entrance in from 8 to 10 fathoms, soft, sticky bottom. There is a passage between Swanson Harbour and Lynn Canal, but this was not examined owing to the short stay of the party from the U.S.S. *Jamestown*, 1880. "Sitka Jack," an Indian chief, has a summer settlement here, and there is also a depôt for wood.

CROSS SOUND.—From Point Couverden the continental shore takes a somewhat irregular direction, W. by N., 20 miles, to a point off which lies a low island, about 6 miles in circuit, with some islets extending about 4 miles eastward of it, together named *Pleasant* or *Porpoise Islands*. All this shore is reported by pilots to be foul for a distance of from 1 to $1\frac{1}{2}$ mile from shore; the Indians, however, report that there are several safe anchorages.

The southern shore of this portion of the strait is of a more broken character than the northern. From Point Augusta to *Point Sophia*, 15 miles to the West, the coast is composed chiefly of rocky cliffs, with islets and detached rocks lying at some distance from the shore. About midway between is *Spaskaii Harbour*, a small cove, and at $2\frac{1}{2}$ to 3 miles N. by E. $\frac{1}{2}$ E. from Point Sophia are the *Sister Islands*, nearly in mid-channel, with a reef, uncovering at low water, a quarter of a mile off the South end of the eastern island.

Port Frederick.—Point Sophia is on the East side of the entrance to this port, which is about 3 miles in width East and West, and thence extending to the southward. On its eastern side is *Hoonyah Harbour*, which was visited by the U.S.S. *Jamestown*, in 1880, and her officers give the following information.

Halibut Rock, uncovering at low water, lies S.E. by S. $\frac{1}{2}$ S. from the inner

island on the western side of the entrance to the port, distant about two-thirds of a mile.

To reach Hoonyah Harbour, after passing Point Sophia, a vessel can safely hug the eastern shore, till up with *Entrance Point*, a high red bluff, on the N.W. side of the harbour, with a pinnacle rock close off it. After this is passed, steer to pass between *Pitt Island*, a low island covered with trees, and the eastern shore, and anchor in about 8 fathoms off the Indian village. The holding ground is excellent, being sticky mud.

About half a mile southward of Pitt Island is *Green Island*, lying off the North side of a larger island named Long Island. Between this and *False Point*, 3 cables to the N.E., is the entrance of a narrow channel, at the head of which is a narrow portage to the upper part of *Siwash* or *Tenakee Channel*, communicating with Chatham Strait, but which is navigable for canoes only.

From the West side of Port Frederick the shore takes a W.N.W. direction, 7 or 8 miles, with some islets near it, to *Point Adolphus*, the North extreme of the Sitka or King George Archipelago, in lat. $58^{\circ} 18'$.

GLACIER BAY.—This large sheet of water, which was visited by Mr. Hanus, U.S.S. *Jamestown*, lies N.W. of Point Adolphus, and extends in the same direction for many miles, terminating at its head in some immense glaciers, rising perpendicularly from the water's edge, and bounded to the North by a continuation of the united lofty frozen mountains that extend eastward from Mount Fairweather. At its southern end is a large group of islets, named *Sand* or *Beardslee Islands*, extending in a north-westerly direction up the centre of the bay for about 15 miles, many of them being high, and covered with timber. It is reported that there are deep channels and safe anchorages among them.

To enter this bay from Cross Sound, when about 2 miles from Lemesurier Island steer about W.N.W. until you enter the bay, and then steer about W. by N., or for *Willoughby Island*, a high island, about 5 or 6 miles long, lying near the southern shore of the bay, at about 12 or 13 miles from its entrance. In entering through the channel North of Lemesurier Island, when near the point where the waters of Cross Sound unite with those of Glacier Bay, it will be necessary to give the northern shore a wide berth, for at this point, which is low, a sand-spit makes out about $1\frac{1}{4}$ mile from the land. In running up to the inlet near Willoughby Island, no bottom was found at 16 fathoms, at a distance of from three-quarters to $1\frac{1}{4}$ mile from the South shore.

Before entering Glacier Bay strong tidal currents or eddies will be encountered, especially to the northward and eastward of Lemesurier Island, and this part of Cross Sound is exceedingly dangerous for sailing vessels, since there is much thick weather and ice in this vicinity. The tide here runs at least 3 knots an hour.

From Point Adolphus the South side of Cross Sound takes an irregular S.W. direction, 17 miles, to *Point Lavinia*, containing many open bays. In the

second bight westward of Point Adolphus there is anchorage in 7 to 15 fathoms, soft mud, said to be secure from all but north-westerly winds. Some sunken rocks lie near the shore hereabout.

From hence the land makes away to the southward, forming a large bight, named *Mud Bay*, the southern shore of which has the appearance of an immense sand spit. In entering from the N.E. the western shore will appear like a group of islands. There is an immense mud-flat, with soundings varying from 4 to 7 fathoms, about three-quarters of a mile to the eastward of the West shore of the bay, and 6 fathoms, mud bottom, was found about three-quarters of a mile from *Goose Island*, which lies just southward of a point appearing to be the outer island. The holding ground is excellent.

Lemesurier Island.—About 7 miles W. by S. of Point Adolphus is the N.E. end of this island, which thence extends $6\frac{1}{2}$ miles S.W. by S. $\frac{1}{2}$ S., moderately high, and covered with timber. Reefs lie off nearly all the points on its S.E. side; off *Iceberg Point* a dangerous reef uncovers for about one-quarter of a mile from the shore at low water, and in rough weather is said to break at least another quarter of a mile farther out.

About midway on the southern shore of the island is a deep bight, known as *Willoughby Cove*, where a small vessel can find an anchorage in 8 to 14 fathoms, muddy bottom, excellent holding-ground. The cove is open from S.E. to N.N.E., and a very strong current sets by just outside, which creates strong eddies, bringing icebergs in dangerous proximity to a vessel anchored too far out.

Dundas Bay.—On the North side of Lemesurier Island is a channel 3 to 4 miles wide between it and the continental shore. The N.W. point of this channel is *Point Dundas*, in lat. $58^{\circ} 20'$, long. $136^{\circ} 9'$, and westward of this point is a branch extending to the North and westward. At about 6 miles up it the channel is nearly stopped by shoals, rocky islets, and rocks, 4 miles beyond which it is finally closed, being in most places greatly encumbered with ice. The entrance, which is about 1 or $1\frac{1}{4}$ mile wide between Points Dundas and *Wimbledon*, has, in mid-channel, only 18 fathoms water. About the entrance the soundings are regular, of a moderate depth, and afford good and secure anchorage; but in the summer season (or in July) vessels would be much inconvenienced by the immense quantities of floating ice.

On the opposite shore of the sound is Point Lavinia, previously mentioned, bearing S.E. $\frac{1}{2}$ E., 5 miles from it. Between these points is a group of one low and two high rocky islands, with some rocks and islets about them, together occupying the greater part of the channel.

Port Althorp is to the westward of Point Lavinia, and extends 11 miles S.E. by E. of it. Its South point of entrance is *Point Lucan*, off which, in a direction about N.W. by W., lies a narrow, high island, about 2 miles in length, named *Three Hill Island*, the central hill being about 1,300 ft. high. Between the S.E. point of this island and Point Lucan there are two small islets and

some rocks, which render that passage not so commodious for sailing in and out of the port as that to the North of the island, between it and the western part of a cluster of three small islands, which extend about 2 miles from the eastern side of the port. This channel is clear, free from danger except close to the islands, and is about $1\frac{1}{2}$ mile in width, with *Granite Cove*, a tolerably snug cove in which Vancouver anchored, just within its N.W. point of entrance, on the South side of *George Island*.

Three Hill Island affords great protection to the northern part of this port, which, opposite to that island, is about $2\frac{1}{2}$ miles wide; but nearly in the middle of the harbour, and opposite the South point of the island, are some detached rocks; and at Point Lucan, which is situated 4 miles S.E. of Granite Cove, the width of the harbour is 2 miles, from whence it extends E.S.E., about 6 miles, and terminates in a basin affording good and secure anchorage, the best passage into which is on the eastern shore.

CAPE SPENCER, the outer North point of the entrance of Cross Sound, on the Pacific Ocean, is a very conspicuous, high, bluff promontory, off which rocks are stated to extend for about $1\frac{1}{2}$ mile. It is in lat. $58^{\circ} 13'$, long. $136^{\circ} 27'$, and bears from Point Wimbledon S. by W. $\frac{1}{2}$ W., distant 9 miles. To the West of Point Wimbledon the main land terminates in steep, rugged, rocky cliffs, off which, at a little distance, are some rocky islands. The bay, extending to the W.N.W. between these points, was occupied by an icy barrier and a great quantity of floating ice (in July, 1794), rendering the navigation across it very difficult and tedious. The head of the bay, which decreases to 3 miles in width, is formed by a range of lofty mountains, connected with which is an immense body of compact perpendicular ice, extending from shore to shore. In the upper part of the eastern side the shores are composed of a border of low land, which, on high tides, is overflowed, and becomes broken into islands.

CROSS SOUND, or *Icy Strait*, was discovered by Capt. Cook, in his last voyage, on Sunday, May 3rd, 1778, and was named by him from the day marked in the calendar. Its existence was denied by some after its original discovery, but the survey of it proves that Cook's description is much more accurate than, from the transitory distant view he had of it, might have been reasonably expected. Its eastern limits may be placed at Points Lavinia and Wimbledon, which have been previously described. From seaward it appears to branch into many openings. Its southern shore, from Point Lucan to Point Bingham, which is opposite to Cape Spencer, trends S.S.W., 10 miles, and about midway between these points *Lisiansky Strait* takes a S.E. by E. direction for about 7 miles, and then turns to the S.W., where it is reported to communicate with the ocean, thus insulating Jacobi Island.

Point Bingham, which lies S.E. by S. $\frac{1}{2}$ S., 11 miles, from Cape Spencer, affords a bold entrance into the sound, without rock, shoal, or any permanent obstacle. The group of rocky islands noticed as existing to the S.E. of Point Wimbledon, form a kind of termination to Cross Sound, and almost separate

the ocean from Chatham Strait, to the eastward of it; but on either side of these islands there are two narrow channels, both of which are free from rocks, shoals, or any other impediment, excepting the large masses of floating ice, which render them very dangerous in the summer season, and in the winter they are most probably entirely closed or impassable.

Every part of Cross Sound appears to be free from any rock, shoal, or permanent obstacle; and if it does possess any navigable objection, it is the unfathomable depth which everywhere exists, excepting very near the shores, along which, in many places, are detached rocks; these, however, lie out of the way of its navigation, and are sufficiently conspicuous to be avoided.

The unfortunate La Pérouse touched on this part of the coast, previous to his departure for the West, in 1786. He makes the following remarks upon it:—At Cross Sound the high mountains covered with snow terminate, the peaks of which are 8,000 or 9,000 ft. high. The country bordering on the sea, S.E. of Cross Sound, although elevated 5,000 or 6,000 ft., is covered with trees to the summit, and the chain of primitive mountains seems to penetrate farther into the continent. *Mount Crillon*, about as elevated as *Mount Fairweather*, is to the North of Cross Sound, in the same way that *Mount Fairweather* is to the North of the *Baie des Français*; they will serve to point out the ports they are near to. The one may be readily mistaken for the other, in coming from the South, if the latitude should not be correct within 15'. Otherwise, from all points, *Mount Fairweather* appears accompanied by two mountains, less elevated; and *Mount Crillon*, more isolated, has its peak inclined towards the South.

CAPE CROSS, which was considered by Cook as forming the S.E. point of entrance to the sound, is not precisely so, but lies about 5 miles S.E. by S. $\frac{1}{2}$ S. from *Point Bingham*, which forms the true S.E. point. The interior part is a low rocky land, free from any danger, but off the cape rocks extend for a distance of about a mile.

From Cape Cross the coast takes a direction of S.E. by E., about 22 $\frac{1}{2}$ miles, to another promontory, to which Vancouver gave the name of *Cape Edward*, and off which lies a cluster of small islets and rocks. The coast between these capes is much broken, and has several openings in it which appear likely to afford shelter, but the vast number of rocks and small islets, which extend to the distance of 3 or 4 miles from the shore, will render the entering of such harbours unpleasant and dangerous, until a more competent knowledge of their several situations may be better acquired. That which appeared to Vancouver to be the easiest of access lies about 6 miles to the N.W. of Cape Edward, and as it is in lat. 57° 44', he was led to conclude that this opening was *Portlock Harbour*.

Portlock Harbour.—About 2 miles from the shore, to the N.W. of the opening, we had 20 and 25 fathoms water, muddy bottom, and just within the

North Pacific.

entrance were some high barren rocks. On getting into the entrance of the passage, which is about a mile across, we deepened the water to 30 fathoms, sandy bottom, the barren rocks just mentioned (and Hogan Island) forming the South side; the northern side is Hill Island, low land. About half a mile within the barren rocks we had 30 fathoms over a rocky bottom, which depth and bottom we carried at least a mile farther, steering N.E. by E., which is nearly the course into the harbour. Presently afterwards we shoaled the water to 10 fathoms, being then in the narrowest part of the channel, not more than half a mile across, having to the North some bold rocks, and to the South a bluff point of land; to the East of which, a small distance from shore, are some rocks which just show themselves above water. Immediately on passing these rocks we deepened the water very quickly to 30 and 40 fathoms, and a most spacious and excellent harbour opened itself to our view, bending to the N.W. and S.E., and running deep in to the northward, with a number of small islands scattered about. We ran up towards the N.W. part of the harbour, and after passing a small island near the North shore, covered with trees, we anchored in 31 fathoms, mud, entirely landlocked, the rocks lying in the inner part of the passage, just shut in with the small island already mentioned, and bearing South, 3 or 4 miles distant.—*Portlock*, pp. 257-8.

Goulding Harbour is a branch of Portlock Harbour, extending from its N.W. part. It runs in a zig-zag direction, between North and N.E., about 5 miles, to the head of it, from the island in the entrance. It appears navigable for at least 4 miles up for vessels of any size, and there are a number of small islands, covered with trees, scattered about in various parts. Wooding and watering are performed with facility.

KLOKACHEVA SOUND, or Olga Gulf.—From Cape Edward the coast takes a direction about E. by S. $\frac{1}{2}$ S. to this very conspicuous opening, named by Capt. Cook the *Bay of Islands*. He rightly considered that it was the entrance to a channel which separated the land, on which Mount Edgecumbe is situated, from the adjacent shores. It is also the entrance to Peril Strait and Pogibshi Channel, separating the two principal islands of the Sitka Archipelago. The names given by Cook and others are now forgotten, and the Russian charts of 1848 and 1853 give Russian names to all the points. Master G. C. Hanus, U.S.S. *Jamestown*, 1880, gives some of the following information.

The entrance of the sound is about 4 miles wide between Klokacheva Island on the North, and *Siouchi Point*, the N.W. point of Kruzov Island, on the South. From hence it extends, with very deep water, 5 miles to N.E. by E., with some islets and rocks off both shores, and then it branches off into two channels, to the N.N.E. and S.E. by E. About a mile within the entrance of the southern channel is the North end of *Partovshikov Island*, which thence extends 6 miles, leaving only a narrow channel on each side of it, leading to the North end of Sitka Sound, *Soukoi Inlet*, to the West, being blocked by shoal water at its South end.

Nevski Strait.—*Kan Islets* lie in mid-channel off the northern side of Partovshikov Island, and Commander Coghlan, U.S.N., 1884, reports that a reef lies 1 cable off the opposite coast, bearing N. $\frac{1}{2}$ W. from the islets. Beyond this the inlet extends 2 $\frac{1}{2}$ miles East to the head of *Baptist Bay*, in which the water shoals gradually from 37 fathoms within its entrance to 6 fathoms at its head.

Between *Kan Islets* and *Baptist Bay* the inlet is about half a mile wide. At midway between, *Nevski Strait* branches off to S.E. $\frac{3}{4}$ E. for 4 miles, and is considerably narrower, the shores for the most part being lined with sunken rocks. Near its southern end is *Whitestone Narrows*, where the channel, having a depth of 5 to 8 fathoms, becomes very narrow, being confined close to the eastern shore by a bed of sunken rocks and kelp extending from the West coast, having a rocky islet, named the *Whitestone*, on its S.E. edge. Here the flood tide comes from the northward.

Vessels entering *Klokacheva Sound* should keep near the middle of the entrance, until close up to the high bluffs of *Baranoff Island*, when, if wishing to pass through *Nevski Strait*, there is a deep but narrow channel between *Kan Islets* and the eastern shore. After this, keep about mid-channel, and when entering *Whitestone Narrows* avoid a sand-spit extending from the eastern shore, and leave the edge of the kelp on the starboard hand.

Pogibshi Channel (*Peril Strait*) is a winding channel, with numerous islets and rocks in it, separating *Chichagoff* and *Baranoff Islands*. Its entrance from the N.E. part of *Klokacheva Sound* is half a mile wide, opening within to a large bay on its East side, named *Rubia* or *Fish Bay*. On the northern side of this bay, about 5 $\frac{1}{2}$ miles from the entrance of the channel, is *Schulze Cove*, free from all visible dangers. The Russian steamers formerly used this cove as a shelter from S.E. gales, anchoring just to the N.W. of the sand-spit extending off the N.W. side of *Piper Island*, which lies on the S.E. side of the entrance.

Surge Narrows is the part where the channel again narrows from *Rubia Bay*. In its entrance is *Pororoga Island*, having some rocks off it, and hence Commander Coghlan recommends that in passing these narrows the navigator should pass within 100 yards of the *Chichagoff* shore. Slack water lasts only about 20 minutes, and at the height of the current it is estimated to run 10 knots an hour. *Wyanda Rock*, one-third of a mile N. by E. from the islet off the North side of *Pororoga Island*, never uncovers, and between this and the sunken ledge extending S.S.E. of the rock southward of *Lesnoi Island*, there is a clear channel several hundred yards wide.

After passing *Deep Bay* the best channel will be found westward of *Small Islands*, which are noted on the U.S. chart close off the prominent point to the northward of *Deep Bay*. Above this the channel trends 3 miles to the N.W., with deep water, and is about half a mile wide. It then opens into a large basin, about 6 miles in diameter, with some islands and rocks near its centre. The track passes southward of these islands to *Nismenna* or *Low Point*, on the

West side of which is *Favourite Anchorage*, close to the shore, about half a mile to the southward of Otstoa or Distant Island, in from 7 to 12 fathoms. The holding-ground is excellent, the bottom being blue mud or clay. This anchorage affords excellent shelter from S.E. around to N.N.W., the hills being high.

In getting under way from this anchorage for Chatham Strait, a good channel, with 7 fathoms water, will be found between Otstoa Island and Nismenna Point, keeping close to the island to avoid the sand spit extending from the point. *Cozian Rock*, a dangerous rock, which breaks in rough weather, lies about N. by E. from the eastern end of Otstoa Island, distant from one-half to three-quarters of a mile. Several vessels have struck upon it.

From hence Pogibshi Channel trends 15 miles East to Chatham Strait, having a group of islands on the South side of its entrance. About 2 cables S. by E. of the eastern point of the anchorage, known on the charts as *Lindenberg Bay*, is *McClellan Rock*, covered at high water, reported by Lieut. McClellan, U.S.N., in May, 1880.

The point of Tchitchagoff Island, at the junction of Peril and Chatham Straits, is named Point Graven, and off it are two rocky islets, with deep water a few hundred yards outside of them. At 2 miles N.W. by N. of Point Graven is *Point Hayes*, close off which is an islet, and a very dangerous reef extends 1 or 1½ mile to E. by S., the outer part of the reef consisting of numerous detached rocks, many showing at low water. About 1 mile northward of this point another reef makes out from the shore, and runs towards Morris Reef. Russian pilots state that this point should not be approached closer than 1½ mile.

From Siouchi Point, the South entrance point of Klokacheva Sound, the coast of Kruzov Island extends 17 miles S.E. by S. ½ S. to Cape Edgecumbe, and nearly midway between them is *Shelikova Bay*, named *Port Mary* by Vancouver, presenting the appearance of a good harbour.

CAPE EDGCUMBE, the S.W. point of Krazoff Island, the Cabo del Engaño of the Spanish charts of Maurelle, is low land, covered with trees, projecting considerably into the sea, in lat. $57^{\circ} 0' 15''$, long. $135^{\circ} 46\frac{1}{2}'$.

Mount Edgecumbe, which stands on the South end of the island, inland of the cape of the same name, is the Mount San Jacinto of the Spanish charts. It was estimated by Lisiansky, who ascended it, to be about 8,000 ft. in height; on the last Russian chart it is said to be only 2,800 ft., a remarkable difference. The side toward the sea is steep, and was covered with snow (in July, 1895); that towards the bay (to the southward) is smooth, and of gradual ascent, and overgrown with woods to within 1½ mile of the top. This upper space exhibits a few patches of verdure, but is in general covered with stones of different colours. On the summit is a basin, or crater, about 2 miles in circumference, and 40 fathoms deep, the surface covered with snow.

SITKA SOUND. The name is that of the natives, who call themselves Sitka-hans. It is probably the same as that called by the Spaniards, *Bay*

de *Guadalupe*. It is also called *Tchinkitanay Bay* by Marchand and other authors. The name of *Norfolk Sound* was applied to it by Dixon, whose industry first made known its real character; he anchored, probably, in the first cove round Cape Edgecumbe, and did not penetrate to the eastward, to where the Russian establishment was afterwards founded. The charts and descriptions of this period are so imperfect that they would probably rather tend to mislead than instruct.

The coast of Sitka Bay is fronted by many steep rocks, and the neighbouring waters thickly sprinkled with rocks, and little rocky islands overgrown with wood, which are a protection against the storms, and present a strong wall of defence against the waves.

A bold, enterprising man, of the name of Baranoff, long superintended the Russian Company's establishment. Although the conquest of the Sitkaens (Sitka-hans), a branch of the Kaloschians or Kalushes, was not easily achieved, he finally accomplished it. A warlike, courageous, and cruel race, provided with fire-arms by the ships of the North American United States in exchange for otter-skins, they maintained an obstinate struggle against the invaders; but Baranoff at length obtained a decisive superiority over them. He built some dwelling-houses, made an intrenchment, and having, in his own opinion, appeased the Kalushes by profuse presents, confided the new conquest to a small number of Russians and Aleutians. For a short time matters went on prosperously, when suddenly the garrison left by Baranoff, believing itself in perfect safety, was attacked by great numbers of Kalushes, who entered the intrenchments without opposition, and murdered all they met with there with circumstances of atrocious cruelty. A few Aleutians only escaped to Kodiak, where they brought the news of the destruction of Sitka. This took place in 1804, at the period that Admiral Krusenstern made his voyage round the world, and his second ship, the *Neva*, was bound for the colony. Baranoff took advantage of this, and with three armed vessels he accompanied the *Neva* to Sitka. The Kalushes retired at his approach to their fortifications, and attempted to maintain a siege, but the guns from the ships soon caused a speedy surrender. They were allowed to retire unmolested, but they stole away secretly on a dark night, after murdering all of their party who might have been an encumbrance to them. Baranoff thus became nominally possessed of the island, but in reality of a hill forming a natural fortification, and formerly inhabited by a Kalush chief called Katelan.

Since the occupation of Sitka by the United States authorities, the approaches to the harbour have been examined, chiefly by Lieut. F. M. Symonds, U.S.S. *Jamestown*, in 1879-80, from whose survey the following description is principally derived. Some information, also, has been obtained from a Report by Mr. G. Davidson, made in 1867.

Sitka Sound is 12 miles wide at the entrance between Cape Edgecumbe and Sitka Point, and the N.W. point of Biorka Island (the *Point Warehouse* of

Vancouver) to the E. by S. From Cape Edgecumbe the North shore runs N.E. $\frac{1}{2}$ E., 7 miles, to *Etmoloi* or *Shoals Point*, nearly a mile E.N.E. of which lie *Low Island* and rocks. Nearly midway between these points, and $1\frac{1}{2}$ mile off shore, lies *St. Lazara* or *Cape Island*, moderately high, and wooded.

Biorka Island, on the South side of the entrance, is about 2 miles in length, densely covered with trees and tall grass, and is the outermost of a labyrinth of islands which extend many miles to the eastward. Several islets and rocks lie off its shores, and the passage eastward of it is studded with sunken rocks, and is therefore dangerous. At more than half a mile S.E. by S. $\frac{1}{2}$ S. from the South extreme of the island, or one-third of a mile from *Neprop*, an islet off it, is the dangerous sunken *Vasileva Rock*. A still more important danger, which will require all caution in entering the sound and making for the settlement, is a *sunken rock*, with only 10 ft. at low water, only breaking occasionally, and lying 2 miles S.W. by W. $\frac{1}{2}$ W. from the N.W. point of Biorka. The channel between this danger and the island is clear, and the western shore of the island is bluff.

Symonds Bay, on the North side of Biorka Island, near its East end, has good anchorage, and was named after the U.S. surveyor. On the West side of the entrance is *Entrance Island*, a barren rock, 50 yards in diameter, and 45 ft. high, an excellent mark. *Hanus Island*, the eastern entrance point, is covered with trees on its western side, and was named after another U.S. surveyor.

The approaches to the bay are free from dangers, with the exception of the rocky patch to the westward of Biorka Island, and it is only necessary to avoid the kelp patches. The first kelp patch on entering is on the western side of the bay, and marks a rock with but 2 ft. water over it at low tide, the only danger in the bay. In entering, avoid the kelp patch northward of Hanus Island, and give the island a berth of 200 yards to the westward, then head for the white sand-beach at the head of the bay, the centre of which will bear about S.S.E. Anchor in 7 fathoms, avoiding the kelp; the holding ground is good, and the anchorage is sheltered against all winds except those between W.N.W. and N. by E. Fresh water and wood may be had in abundance. It is high water here, on full and change, at 0^h 24^m; springs range 9 to 10 ft.

Within Biorka Island the South shore of the sound is formed by innumerable rocks and low wooded islets, and the coast is indented by large bays. The outermost rocks appear to be the *Vasilevka*, $5\frac{1}{2}$ miles North of the N.W. end of Biorka Island, and lying some distance off the low islands inside; the sea breaks upon some of them.

Between *Otmeloi Point* and *Bouronov Point*, to E. by N. $\frac{1}{4}$ N., Sitka Sound becomes contracted to a width of $7\frac{1}{2}$ miles, having several islets and groups of rocks on this line, the channel invariably used by the Russians being that between *Vitskari Island* and *Kulich Rock*, about 2 miles apart E. by N. $\frac{1}{4}$ N. and W. by S. $\frac{1}{4}$ S. *Vitskari Island*, 7 miles to the N.N.W. of the N.W. point

of Biorka, is very low and small, and on it is a conical stone *beacon*, the summit of which is 41 ft. above high water. The reef, marked on the British Admiralty chart as extending nearly a mile to N.E. by E. $\frac{1}{2}$ E., is stated not to exist, but three clumps of rocks, about a quarter of a mile apart, have been observed to the N.W. of the island. *Kulich Rock* is stated to be about 20 ft. high, with deep water and dangerous sunken rocks between it and the islets off Bouronoff Point. Reefs awash lie about one-third of a mile N.N.W. and southward of it.

Within this the settlement is fronted by an intricate range of scattered islets and rocks, between which there are three principal channels to the harbour, which should only be entered under the guidance of a pilot, or with good local knowledge. Any detailed description is unnecessary, as the chart derived from the late U.S. survey will be the best guide. Directions are given hereafter for the approaches.

Commander R. W. Meade, U.S.S. *Saginaw*, 1868, states that in fine weather pilots may readily be procured, the charge for men-of-war being 4 dollars per foot, the pilot taking the ship outside of Biorka Island or Cape Edgecumbe.

The outer most conspicuous island is named *Makhnati*, about 50 ft. high, and covered with a thick growth of spruce. On its summit is a pyramid *beacon*, formed of heavy logs, the summit being 72 ft. above high water, and bearing about S.W. $\frac{3}{4}$ S., nearly 5 miles, from Vitskari beacon. A dangerous rock, with 9 ft. water over it, lies about $2\frac{1}{2}$ cables S.S.W. of its East point.

The *Eastern Channel* to the harbour is the widest and safest, the Middle and Western Channels being narrow and somewhat tortuous. On the South side of the entrance, which is two-thirds of a mile wide, are a group of islets and rocks, near the middle of which, on *Eckholm Islet*, a *beacon* has been erected, its summit 72 ft. above high water, and similar to that on *Makhnati*. At a little over a mile S.W. $\frac{1}{2}$ S. from this beacon is *Zenobia Rock*, with 15 ft. water over it.

Middle Channel has several dangers in it, and is therefore not recommended. In case it should be necessary to enter by this channel, its dangers will be best avoided by passing between Passage and Kayak Islets, which are about 2 cables apart.

Western Channel is wider than Middle Channel, but it is difficult to reach the settlement by this passage, as it becomes very contracted at its eastern end. The entrance is westward of *Makhnati Island*, and on the same side, three-quarters of a mile within, is *Whiting Harbour*, between *Japonski Island* and the islands to the S.W. of it. Here the holding ground is good, with excellent shelter from N.E. gales.

Directions.—In entering Sitka Sound in a sailing vessel, with the wind from the north-westward, it is advisable to give the Mount Edgecumbe shore a wide berth, as under the influence of that high land the wind is apt to fail and fall calm when the vessel is in the vicinity of Vitskari. Biorka Island should be given a berth of at least $2\frac{1}{2}$ miles, and to clear the sunken rocks westward

of it, do not bring Vitskari beacon to bear northward of N. $\frac{1}{2}$ E. In entering the harbour, leave the beacon on Vitskari half a mile to port. To an approaching vessel the islands about Sitka appear as one confused mass, but they may be approached boldly until the beacons are made out, after which the position may be plotted accurately, and the desired channel chosen without difficulty.

After passing Vitskari Island, steer N.E. $\frac{1}{2}$ N., until the beacon on Eckholm Island bears E.N.E., after which Eastern Channel may be entered with safety, keeping well on the South side of the channel in order to clear Simpson Shoal and Tzaritza Rock. Vessels drawing more than 21 ft. must avoid a rocky patch lying E. by N. from Entrance Island (or the Twins), by passing within 300 yards of the eastern extremity of that island.

With regard to the anchorage at Sitka, Commander Beardslee, U.S.S. *Jamestown*, remarks, that ordinary gales blowing from S.E. and S.W. outside are deflected to N.E. and South, respectively, before reaching the inner anchorage. Very heavy S.E. gales, however, blow home with a force greater than is felt from any other direction. Occasionally a heavy N.E. gale sends through the valleys heavy squalls from E.N.E. For these reasons it is necessary to moor very securely, if remaining here for any considerable time. The *Jamestown* was moored in the western harbour, abreast the Indian village westward of the town, with the eastern extremity of Harbour Island bearing S.E. $\frac{1}{2}$ S., and the East point of Japonski Island S.W. by S. $\frac{1}{2}$ S., and this anchorage is recommended to vessels visiting the harbour with the intention of remaining for some time.

Tides.—It is high water at Sitka, on full and change, at 0^h 33^m; springs rise 9 to 12 ft.

Besides the approach from the S.W., a good passage exists between the North part of Sitka Sound and Klokachev Sound, by passing through White-stone Narrows, described on p. 627.

SITKA or New Archangel, formerly the Russian establishment, stands on the N.W. side of a bay on the eastern side of the sound, about 12 miles within the entrance, the observation spot being in lat. 57° 2' 52", long. 135° 19' 45" W. In 1883 it had a population of about 300 whites, and 200 Russians or Creoles, their principal occupation being catching and curing salmon. There is a custom-house here, also a hospital, saw-mills, school, stores, &c., besides the official establishment. There is monthly communication with Portland (Oregon) by steamer, and there is regular steam communication with San Francisco, distant about 1,500 miles.

A light is shown from the Governor's house when a vessel is expected, and on firing a gun or rocket it will be answered.

As before stated (p. 592), the climate is not so severe as the latitude would seem to warrant. The mean temperature in summer is about 55° F., and in winter about 32° only.

Mr. Frederick Whymper visited Sitka in 1865, and his interesting volume,

chapter vii, will give a good account of its condition at that time. The following is taken from an article in the *Mercantile Marine Magazine*, 1869, which gives a description of the place as it is under the new régime.

The harbour of Sitka is a very picturesque one, with plenty of water for the largest ships to pass in and out, but a dangerous one, owing to the large number of little islets and rocks, between which pass narrow channels, any of them with sufficient water to float a ship, but hardly sea-room enough to be safe; however, the old Russian pilot seems to have no difficulty in getting through them when required. The entrance to the harbour is superb. Mount Edgecumbe towers up some 8,000 ft. above the level of the sea; its immense crater, filled with snow, marks the north-western boundary of the harbour, and can be seen at a great distance. Baranoff Island is made up of mountains piled on mountains, looking as if pushed up out of the sea by some grand convulsion of nature at no very distant day, as evidenced by their peaked summits and jagged outlines.

The town of Sitka, formerly New Archangel, is situated on a point of land jutting out into the bay, from the base of the mountains, probably containing about 1,000 acres, and from the character of the soil appears to have been made by the washings of the ocean. On the point is a large lake of fresh water, in front of which, along the edge of the bay, are about 150 log houses, scattered about promiscuously. There is but one street, and that extends throughout the whole length of the town, and is continued for about a mile to Indian River, a little mountain stream emptying into the bay at this point. This is the only road on the island; beyond this, and, in fact, on all sides of the island, for some distance before you reach its termination, the thicket is impenetrable. This little river furnishes splendid water, cold as ice, and seems to get its supply from the melting snows on the summit of the mountains. To this little river the road leads, and was made by the Russians for the purpose of getting water, as the lake water is hardly fit to drink. There is not a well or cistern on the island, a large proportion of the water used being carried in small casks slung on a pole, on the shoulders of two men or women.

The governor's house is built on a rock, and overlooks the town and bay; it is a very large structure, and formerly furnished not only a residence for the Russian governor, but for many of the officers of the Company. The house is surrounded by a wide platform, the side towards the bay being protected by a redoubt and stockade, in which cannon were mounted, as well as on the platform. The garrison flagstaff is on this platform. All approaches to it were well guarded. On the other three sides were the Company's warehouses, forming a hollow square, with a battery of some twelve or fourteen guns bearing on the Indian village, and one of the approaches to the town.

The stockade, separating the Indian village from the town, runs in a north-easterly direction, and is about 1 mile in length, terminating at the lake. The

North Pacific.

Indian village fronts the bay, and contains about one hundred large huts, built of hewn logs, and very substantial—built for defence as well as to live in.

The Greco-Russian church has rather an imposing cathedral here, which is a great relief to the appearance of the town. It has a dome and steeple, with a chime of bells, and stands nearly in the centre of the town, fronting the main street—in fact is in its centre—the street fronting on each side. It is built in the form of a cross, and, although it has a rather rough exterior, is very gorgeous inside, decorated with the paraphernalia appertaining to the church service, which is very imposing and magnificent. The church property here consists of the bishop's house, widows' home, cathedral, and chapel.

About $1\frac{1}{4}$ mile eastward of the settlement is *Jamestown Bay*, where fresh water may be obtained; a small jetty has been built here to facilitate the supply.

Biorka Island, or *Point Wodehouse*, as previously mentioned, is the S.W. point of Sitka Sound. An extensive group of islets and rocks extend E.S.E. from it for 3 or 4 miles from the shore, which takes a course about S.E. by E. This part of the coast is much broken into small openings, with islets and detached rocks lying off it. We can offer no account of it.

At 20 miles from Biorka Island the Russian charts show an extensive inlet, trending to the N.N.E., named Whale Bay. It is the *Port Banks* of Captain Dixon, and is in lat. $56^{\circ} 38'$. The following are Dixon's remarks on it:—"The prospect at Port Banks, though rather confined, yet has something more pleasing and romantic than any we had seen on the coast. The land to the northward and southward rises sufficiently to an elevation to convey every idea of winter; and though its sides are perpetually covered with snow, yet the numerous pines, which ever and anon pop out their lusty heads, divest it of that dreary and horrific cast with the barren mountains to the N.W. of Cook River (Inlet). To the eastward the land is considerably lower, and the pines appear to grow in the most regular and exact order; these, together with the brushwood and shrubs on the surrounding beaches, form a most beautiful contrast to the higher land, and render the appearance of the whole truly pleasing and delightful."

Cape Ommaney, the southern extremity of the Sitka Archipelago, lies about 53 miles from Point Wodehouse, and has been previously described on pp. 612 and 619.

Thus the entire circuit of this archipelago has been imperfectly noticed.

We now return to the northward, taking up the description at the point where Cross Sound terminates. This description, however, must be considered as imperfect, as we are chiefly dependent for our information on the remarks of the old navigators. Several of the more important points have been examined, of late years, by the American surveyors, but no systematic survey has

yet been carried out. Attention will be drawn to their Reports in the parts where these localities are described.*

Cape Spencer, the point above named, has been noticed on p. 624.

From Cape Spencer the coast takes a general direction of about W. $\frac{1}{2}$ N. It is steep and entire, well wooded, and, with the exception of one opening, Lituya Bay or Altona Gulf, between it and Cape Fairweather, appears not likely to afford shelter for shipping. The coast is completely bounded at a little distance by steep, compact mountains, which are a continuation of the same undivided range stretching from the eastward.

At 15 miles westward of Cape Spencer is *Forest Cape*, with a small open bay on its eastern side, having the most southern sea-coast glacier on its N.E. side. *Icy Cape* is about 10 miles farther on, and at 13 miles northward of it is *Mount Crillon*, about 15,900 ft. high. At 32 miles West of Cape Spencer is the narrow and dangerous opening to *Lituya Bay* or *Port Français*, which extends to N.E. by N. for 6 miles, and then branches into two arms about 3 miles long. The entrance lies 2 or 3 miles westward of the termination of the rocky bold bluffs in coming from the southward. The best anchorage is just inside the North point, but the entrance is said to be very dangerous, from the strong currents rushing over hidden rocks. A small river, frequented by salmon, enters the sea $1\frac{1}{2}$ mile N.W. by N. of the bay.

CAPE FAIRWEATHER lies 22 miles to N.W. by W. of Lituya Bay, the coast between being low and sandy. It is placed by Vancouver in lat. $58^{\circ} 50\frac{1}{2}'$, long. $137^{\circ} 50'$, and cannot be considered as a very conspicuous promontory; it is most distinguished when seen from the southward, as the land to the West of it retires a few miles back to the North, and there forms a bend in the coast; and it is the most conspicuous point eastward of Cape Phipps, at Behring Bay, to the W. $\frac{1}{2}$ N.

MOUNT FAIRWEATHER is one of the most remarkable mountains on the N.W. coast of America; it is about 15,500 ft. high; in lat. $58^{\circ} 54\frac{1}{2}'$, long. $137^{\circ} 31'$, and 9 miles from the nearest shore, its peak being always covered with snow. Capt. Cook says:—"This mountain is the highest of a chain, or rather ridge of mountains, that rise at the N.W. entrance of Cross Sound, and extend in a N.W. direction, parallel with the coast. These mountains were wholly covered with snow (in May, 1778), from the highest summit down to the sea-coast (which was 12 leagues distant), some few places excepted, when we could perceive trees rising, as it were, out of the sea, and which, therefore, we supposed grew on low land, or on islands bordering on the shore of the continent."

The waters surrounding Alaska have always been celebrated for their whale

* Reference has been made, in the following description, to the "Report of Mr. George Davidson, relative to the Resources and Coast features of Alaska," in the U.S. Coast Survey Report, 1867, pp. 187—321.

fisheries. Some of the Russian navigators inform me that their best whaling ground, from the middle of June to the middle of July, was in the region named Fairweather Ground, lying between Pamplona Reef and the shores off Mount Fairweather. The richness of this locality is confirmed by all the old navigators and fur traders.—*Mr. G. Davidson, 1867.*

From Cape Fairweather to *Cape Phipps*, the South point of the entrance of Behring Bay, the distance is 71 miles, West; the intermediate coast is a low border extending from the base of the mountains, well wooded, and in some parts appears to be much inundated, the waters finding their way to the sea in shallow rivulets, through two or three breaks in the beach. The most important stream is the *River Alsek*, which, when its waters overflow, form an extensive shallow bay or lagoon, named *Dry Bay*, at about 17 miles from Cape Fairweather.

BEHRING BAY, or *Yakuta Bay*, the true situation and character of which was first elicited by Vancouver, runs inland, to the N. by E., between Cape Phipps and Point Manby. Capt. Cook, supposing that a bay existed to the S.E., conceived it to be the bay that Chetrow, the master of Behring's fleet, reconnoitred. This mistake was also followed by Capt. Dixon, who gave the name of Admiralty Bay to that in question; but as Behring certainly was the discoverer of a bay in this locality, and there being but one, the name of that navigator has supplanted that applied by Dixon.

The general direction of the bay is N. $\frac{1}{2}$ E. for 24 miles, diminishing from 18 miles in width, at 4 miles from the entrance, to Digges Sound at its head. The S.E. shores of the bay are fringed by numerous wooded islands, forming a great number of small bays and anchorages, with very deep water in most of them, and the entrances have strong currents, rendering them difficult of access for sailing vessels. The North shore is represented as low and sandy.

Cape Phipps, the south-easternmost point of Behring Bay, is in lat. $59^{\circ} 33'$, long. $139^{\circ} 47'$. This cape and *Ocean Cape*, 3 miles southward of it, are represented as low and sandy, the whole peninsula being an intricacy of crooked channels. About 2 miles within it, the coast taking an easterly direction, there is a small opening in the low land, accessible only for boats, near which was found an Indian village. Capt. Sir Edward Belcher states that he was driven much to the westward by the current near Cape Phipps.—(Vol. i, p. 82).

Point Turner, which is a low, narrow, wooded strip of land, forming the S.E. point of the island that protects Port Mulgrave from the ocean, is E.N.E., $2\frac{1}{2}$ miles, from the inner or North point of Cape Phipps. About 3 miles N.E. by E. from Point Turner is a point on the main land, which is the East end of a rounding bay, about 4 miles across to Cape Phipps. It is necessary to give a good berth to Cape Phipps, in order to avoid a small reef that stretches from it into the sea. Cape Turner, on the contrary, is bold, and must be kept close on board, for the purpose of avoiding the shoals that lie a little distance to the

eastward of it; between these shoals and the point good anchorage is found in 8 to 14 fathoms, clear good holding ground.

The rise and fall of the tide here are about 9 ft. ; and it is high water about 30' after the moon passes the meridian.

PORT MULGRAVE lies to the eastward of Point Turner, and is protected from the ocean, as before stated, by an island lying in a North and South direction. It was possibly first discovered by Capt. Dixon, June, 1787, who named it after that nobleman. It contains a number of small low islands, which, in common with the rest of the coast, are entirely covered with pines, intermixed with brushwood. To the North and N.W. are high mountains covered with snow, about 30 miles distant.

It was visited by Sir Edward Belcher, in H.M.S. *Sulphur*, who stayed a short time here. Fish, halibut, and salmon of two kinds, were abundant and moderate, of which the crews purchased and cured great quantities. Game very scarce. The remains of the Russian establishments were observed; a blockhouse pitched on a cliff, on the East side; and on the low point, where the astronomical observations were taken, the remains of another; also a staff, with a vane and cross, over a grave. Sir Edward Belcher says that a good leading mark for the entrance to the harbour is Mount Fairweather over Cape Turner.

An off-shore shoal, 7 fathoms, sand, was probably crossed by the *Sulphur* in coming out of Port Mulgrave, when no land could be seen within 3 miles.—(Belcher, vol. i, p. 89).

The island or islands before alluded to, which form the outer face of Port Mulgrave, and of which Point Turner is the S.W. extremity, extend for 8 miles in length. They are almost joined to the continental shore by a spit incommoded with many rocks and huge stones, but leaving a very narrow channel, by which Vancouver's vessel, the *Chatham*, passed from one part of the inlet to the other, from the northward. The depth in the shallowest part is about 15 feet.

Knight Island is 5 miles N. by W. of the northern entrance to the channel just described. It admits of a navigable passage all round it, but some rocks lie about half a mile from its West point; and there is an islet situated between it and the main land, on its N.E. side.

Eleanor Cove.—From the North entrance to Port Mulgrave the continental coast takes a northerly direction, 6 miles, to this cove, which is the eastern extremity of Behring Bay. It is protected from the westward by Knight Island, which is about 2 miles long in a N.E. and S.W. direction, and about a mile broad, lying at the distance of a mile from the main land.

The shore here is low, and trends about N.W., 6 miles, to *Point Latouche*, the S.E. limit of *Digges Sound* or *Bay*. The two points forming the entrance to Digges Sound, thus named by Vancouver, are bluff, lying about $1\frac{1}{2}$ mile apart N.E. by E. and S.W. by W., the easternmost of them being Point La-

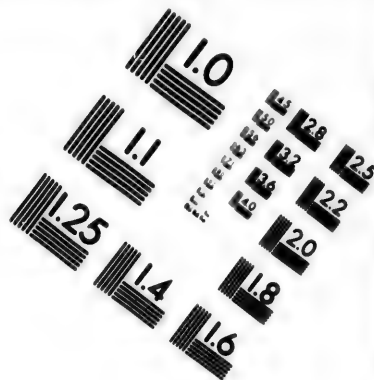
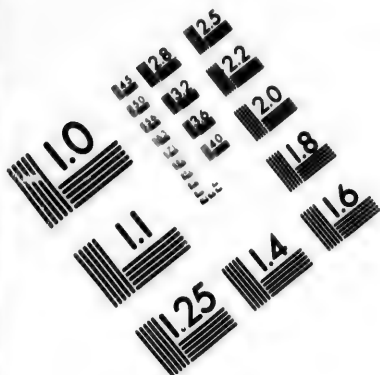
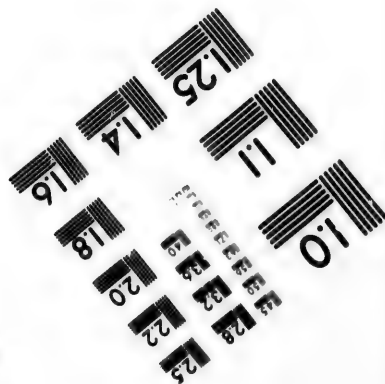
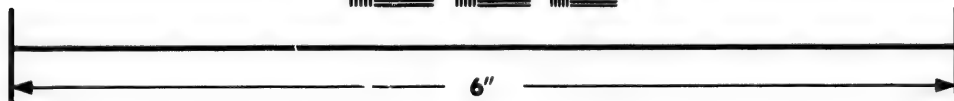
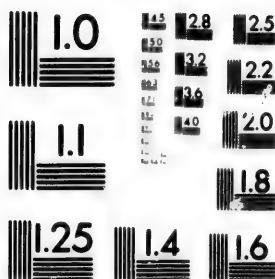


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touche, as above mentioned. The shores are composed of a continuation of the low border extending from the foot of the mountains to the sea-side, and are bounded by frozen ice or snow, especially in the sound.

From Digges Sound the continental coast, forming the North side of Behring Bay, runs first to S.S.W., and is nearly straight and compact. At 8 miles from the opening the land falls back, forming a small bay, with a low island about 2 miles long to the N. by W. of it. The coast here trends S.W. by S., 8 miles, and then S.W. by W., 6 miles, to Point Manby.

Point Manby, 18 miles W. by N. from Cape Phipps, is high, and forms the N.W. point of Behring Bay; it is in lat. $59^{\circ} 43'$, long. $140^{\circ} 13'$. To the eastward of it the country is well wooded, and proceeding northward it loses its verdant and more fertile appearance; the coast still continues to be a low compact border of plain land. The depth is generally from 5 to 12 fathoms at 2 cables from the shore.

Point Riou, about 25 miles from Point Manby, though no longer existing, was a tolerably well-marked promontory at the period of Vancouver's survey, and to whom it owes its name. He describes it as being low, well wooded, with a small detached islet at a little distance to the westward of it, which might have been a mass of earth-covered ice ground. The coast is still composed of a spacious margin of low land, rising, with a gradual and uniform ascent, to the foot of the still connected chain of lofty mountains, whose summits are but the base from whence Mount St. Elias towers majestically conspicuous in regions of perpetual frost. Vancouver's charts, from the extensive changes continually going on, present but little to recognise in this part at the present period.

ICY BAY, to the W. by N. of what was Point Riou, is terminated by steep cliffs, from whence the ice descends to the sea. At the eastern side of the bay the coast is formed of low, or rather moderately elevated, land. *Icy Cape*, its West point, is a high, abrupt, cliffy point, bounded by a solid body of ice or frozen snow, 7 miles W. by N. from Point Riou. Tebenkoff gives soundings of 12 to 15 fathoms inside the entrance, and 5 fathoms at the head, but it is entirely open to southerly winds.

This portion of the coast was visited by H.M.S. *Sulphur*, in her voyage round the world, in 1837, and the following are Sir Edward Belcher's remarks, made during that visit:—

"Icy Bay is very aptly so named, as Vancouver's Point Riou must have dissolved, as well as the small island also mentioned, and on which I had long set my heart, as one of my principal positions. At noon we tacked, in 10 fathoms, mud, having passed through a quantity of small ice, all of a soft nature. The whole of this bay, and the valley above it, was now found to be composed of (apparently) snow-ice, about 30 ft. in height at the water cliff, and probably based on a low, muddy bench, the water for some distance in contact not even

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Mount St. Elias

From Adm Fitz Roy's Voyage of the Beagle

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showing a ripple; which, it occurred to me, arose from its being charged with floating vegetable matter, probably pine-bark, &c.

"The small bergs, or reef masses of ice, forming the cliffy outlines of the bay, were veined and variegated by mud streaks, like marble, and, where they had been exposed to the sea, were excavated into arches, similar to some of our chalk formations. The base of the point, named by Vancouver Point Riou, probably remains; but being free, for some distance, of the greater bergs, it presented only a low sand or muddy spit, with ragged, dirty-coloured ice, grounded. No island could be traced, and our interest was too deeply excited in seeking for it, to overlook such a desirable object.

"The current was found to set $1\frac{1}{2}$ mile per hour, West, varying but slightly in force, and not at all in direction. At this position we anchored in 50 fathoms, mud, near Mount St. Elias; not a single drift tree was noticed. We were within the white water about 2 miles, which I am now satisfied flows from the ice, but why it preserves its uniformity of strength and direction is yet a problem to be solved."

MOUNT ST. ELIAS is one of the most remarkable features of North-West America. It is a noble conical mountain, rising far into the clouds, and although in a climate far from temperate, and of such an elevation as to lead to the conclusion that it rises far into the limits of perpetual snow, yet Sir Edw. Belcher says:—"Its edges, to the very summit, present a few black wrinkles, and the depth of snow does not, even in the drifts, appear to be very deep. It stands, as it were, as before mentioned, upon the summit of the lofty range which runs parallel with the sea coast." Its elevation, according to the angular measurement of the U.S. Coast Survey, is about 19,500 ft. above the sea, and, even when seen at 150 miles distant, it appears to be a majestic mountain. Its discoverer was the celebrated Behring, who made the coast here on the 20th of August, 1741, the name being applied from the saint to whom that day is dedicated. Its lat. is $60^{\circ} 20\frac{1}{2}'$ N., long. $141^{\circ} 12'$ W.*

Pamplona Rock, &c.—According to some information given to Vancouver's party by the Russian officers he met here, there is a very dangerous rocky shoal, about 15 miles in length, lying by compass in a direction S. by W., 63 miles, from a place called by them *Leda Unala*. This Mr. Puget conceived to be near the point called Point Riou. The Russian officer, Portoff, himself had been on the shoal, taking sea otters, and stated that the first discovery of it was owing to a Russian galliot having had the misfortune, some years before, to be wrecked upon it. Two of the crew were drowned, but the rest escaped in their boats. After that period an annual visit had been made to it, for the purpose of killing sea otters, which were there met with.

From the Spaniards, also, Vancouver learnt that a very dangerous rock existed

* For further information, see a "Report on Mount St. Elias, and some of the adjacent mountains," by Mr. W. H. Dall, in the U.S. Coast Survey Report, 1875, pp. 157—188.

in this neighbourhood, the situation of which they had taken great pains to ascertain, and had found it to lie E. by S. $\frac{1}{2}$ S. from Cape Suckling, at the distance of 78 miles, and which was called by them Rook Pamplona. By this bearing it appears to lie E. by N., 8 miles distant from the rocky shoal described by the Russians above; here it may be inferred that Portoff and the Spaniards intended the same shoal, though it is not stated by the latter to be so extensive as by the former.

It is without doubt dangerously situated for the navigation of this coast, and may possibly have proved fatal to Mr. Meares's consort, Mr. Tipping, who, with his vessel, was never heard of after leaving Prince William Sound in 1786.

The Coast, from Icy Bay, extends to the W. by S., and is low, without anything remarkable for 40 miles, where there is a small river, called by the Russians *Riko Balshe Unala*. It has a bar, and but little depth of water. *Cape Yaktaga*, 23 miles W. $\frac{1}{2}$ S. of Icy Cape, is a low rounding point of land; Tebenkoff lays down some sunken rocks at 3 or 4 miles S.W. of it. At 46 miles westward of this cape is the southern extremity of the extensive *Laeda Reef*, stretching 6 miles from the shore.

A few leagues westward of the *Riko Balshe Unala* is another small river, emptying itself into a shallow bay. Its entrance is obstructed by a bar, on which, with easterly winds, the sea breaks with great violence.

The coast between this and Cape Suckling shoots out into small projecting points, with alternate low, cliffy, or white sandy beaches, being the termination of a border of low woodland country, extending some distance within, until it joins the foot of a closely-united chain of lofty frozen mountains, which is connected with the same range that extends to the north-westward around Prince William Sound and Cook Inlet. From these low projecting points some shoals stretch into the ocean. Vancouver passed one of these at the distance of about 4 miles, sounding in 35 fathoms; it extends in a southerly direction, 2 miles from a low point of land that forms the West point of a bay, apparently very shoal. From the West point of this bay, in lat. $60^{\circ} 3' 30''$, the shore towards Cape Suckling makes a small bend to the north-westward, but the general direction of the coast is nearly N.E. and S.W., and appears to be firm and compact.

CAPE SUCKLING, so named by Cook in his third voyage, is conspicuous. Vancouver, differing much from Cook, places it in lat. $60^{\circ} 1'$, long. $143^{\circ} 41'$, but the longitude is considered by Raper as $143^{\circ} 54'$.^{*} The point of the cape is low, but within it is a tolerably high hill, which is disjoined from the mountains by low land, so that at a distance the cape looks like an island.

^{*} It may be stated that the charts drawn up by Vancouver were found by Sir Edward Belcher to be plainly erroneous about this region. All his transit bearings and other observations indicated this. A river appears to flow near Cape Suckling, which has not been noticed.—*Voyage of the Sulphur*, vol. i., p. 175.

When near Cape Suckling, Capt. Sir Edward Belcher says:—"Our attention was suddenly attracted by the peculiar outline of the ridge in profile, which one of our draughtsmen was sketching, apparently toothed. On examining it closely with a telescope, I found that although the surface presented to the naked eye a comparatively even outline, it was actually one mass of small, four-sided, truncated pyramids, resembling salt-water mud which has been exposed several days to the rays of a tropical sun (as in tropical salt marshes), or an immense collection of huts.

"For some time we were lost in conjecture, probably from the dark ash colour; but our attention being drawn to nearer objects, and the sun lending his aid, we found the whole slope, from ridge to base, similarly composed; and as the rays played on those near the beach, the brilliant illumination distinctly showed them to be ice. We were divided between admiration and astonishment. What could produce these special forms? If one could fancy himself perched on an eminence, about 500 ft. above a city of snow-white pyramidal houses, with smoke-coloured flat roofs, rising ridge above ridge in steps, he might form some faint idea of this beautiful freak of nature."

Cape Suckling is a low neck, stretching out from a mountainous, isolated ridge, which terminates about 3 miles from it easterly, where the flats of the ice pyramids just alluded to terminate. Apparently the river or opening near Cape Suckling flows round its base. There is little doubt but that we may attribute the current to this outlet, arising, probably, from the melting of the snow. We had less strength of current after passing this position. Immense piles of drift wood were noticed on each side of the opening, but none elsewhere. The current was northerly.

At the western limit of the cape commences a long reach of low sandy beach, from 5 to 10 miles in width, and bordering the coast to *Hinchinbrook Island*, a distance of 75 miles. This flat is cut through by numerous streams, and at 1 to 2 miles distant the depth is not more than 5 to 10 fathoms.

Kaye or Kayak Island, to the S.W. of the cape, is long and narrow. Its South point, named by Vancouver *Cape Hamond*, is very remarkable, being a naked rock, elevated considerably above the land within it. There is also an elevated rock lying off it, which, from some points of view, appears like a ruined castle. A sunken rock is also said to lie 13 miles S.E. by S. $\frac{1}{2}$ S. of it, but its existence is doubtful. Towards the sea the island terminates in a kind of bare, sloping cliffs, with a narrow, stony beach at their foot, and interrupted with some gullies, in each of which is a rivulet or torrent, and the whole surmounted with a growth of smallish pine trees. Off its N.E. point a rocky reef extends to the beach.

"Kaye Island, viewed from the eastward, presents the appearance of two islands. The southern is a high table-rock, free from trees and vegetation, and of a whitish hue; the other is moderately high land for this region, with

three bare peaks, its lower region being well wooded."—*Sir Edw. Belcher*, vol. i., p. 70.

Wingham Island.—About 2 miles off the N.W. point of Kaye Island is Wingham Island, low, and about 4 miles long. Off its N.E. point, *Point Mesurier*, are some elevated rocks. Vancouver says there is a tolerably well-sheltered roadstead on its eastern side, reached by passing its North end from the West through a narrow channel and close to the shore. Within this, and to the W. by N. of Cape Suckling, is *Comptroller Bay*, which is shoal, and extends 20 miles westward to Point Hey.

Wingham Island, which can be seen to nearly its whole length between Cape Suckling and Point Le Mesurier, is moderately elevated, rising in three hummocks, which are bare on their summits. The southern, at a distance, owing to the lowness of the neck, appears separated. The whole is well clothed with trees.—*Sir Edward Belcher*.

At about 40 miles from Cape Suckling is the mouth of *Atna* or *Copper River*, the latter name being taken from the deposits of native copper on its banks. There was a Russian trading post some distance up the river, and the district is reported to be scantily peopled.

Middleton Island (*Otchek*).—The position of this isolated island is not positively determined. It is reported to be above 7 miles long and 3 miles broad, its North end being in lat. $59^{\circ} 30' N.$, long. $146^{\circ} 30' W.$ Reefs extend 3 miles off each end of the island, and off the northern end is a rock, upon which the water breaks in great jets, and thence named the *Fountain*. About the middle of its western side is a small cove, with 13 fathoms over gravel. The island is low and level, and is frequented by the natives for sea-weed and seals.

Sea Otter Bank lies nearly equi-distant between Otchek and Kayak Islands, being 23 miles N. by E. $\frac{1}{2}$ E. from the former, and 32 miles E. by N. $\frac{1}{2}$ N. from the South end of the latter. It is laid down as two rocks, and has not been examined.

PRINCE WILLIAM SOUND was first explored by Capt. Cook in his last voyage.* Although this extensive inlet was before known to the Russians, the coast took him ten days to traverse, 11th to 21st of May, 1778, a week of which was spent in the inlet; but, from the subsequent survey of Capt. Vancouver, it was found that no portion of his celebrated predecessor's labours were so defectively described and delineated as this, which leads to the supposition that some important authority has been omitted in the drawing up of the narrative, which would not have occurred had the unfortunate circumnavigator survived to superintend its publication. From the minute examination which was made

* Prince William Sound, and particularly its N.E. part, was visited by Senr. Fidalgo, in 1790, for the purpose of inquiring into the nature and extent of the Russian establishments in these regions.

of it by Vancouver, it proved to be a branch of the ocean that requires the greatest circumspection to navigate; and although it diverges into many extensive arms, yet none of them can be considered as commodious harbours, on account of the rocks and shoals that obstruct the approaches to them, or of the very great depth of water about their entrances.

The N.E. point of the coast, where the sound commences, is *Cape Witshed*, which is 43 miles from Point Hey, last described, the coast between being fronted by a very extensive mud-flat. The outward coast of the sound is formed by Hinchinbrook and Montagu Islands; between and to the West of which are the entrances to it.

Many of the islands and projecting points are low and wooded, but behind these rise icy mountains. The waters of the sound are very deep, the rise and fall of the tide large, and the currents are very strong, with strong tide ripplings in the entrance between Port Etches and Montagu Island. The weather here is very changeable, and sudden squalls of wind and thick fogs prevail.

HINCHINBROOK ISLAND is the north-easternmost of those before Prince William Sound. Its N.E. point, named *Point Bentinck*, is opposite to Point Witshed, about 3 miles asunder, the space between occupied by a low, barren, uninterrupted sand at low water, being a continuation of the sand-bank extending from Comptroller Bay, and also along the coast to the northward of Point Witshed. It is dry at low water, but at high water it was stated that there is a boat channel, though Vancouver's party found the whole space occupied by a most tremendous surf, rendering any passage at that time impracticable. *Cape Hinchinbrook*, the S.W. point of the island, is 20 miles S.W. by S. $\frac{3}{4}$ S. of Point Bentinck, and is placed by Vancouver in lat. $60^{\circ} 16\frac{1}{2}'$, long. (corrected) $146^{\circ} 27'$. In a direction S. by W., 7 miles from the cape, are *Seal Rocks*, a barren, flat, rocky islet, with several rocks lying at a small distance from it. This lies, therefore, off the entrance to the sound between Hinchinbrook and the N.E. end of Montagu Island.

Between Montagu and Hinchinbrook Islands Captain Sir Edward Belcher found shoal water, contrary to Vancouver's idea, rendering it necessary to anchor in 17 fathoms, the tide running at 3 knots.

Port Etches,* or *Nuthek Bay*, is on the eastern side of the entrance into the sound, consequently on the western end of Hinchinbrook Island. The depth off the North point of the entrance is very great; no bottom with 100 fathoms could be found within a quarter of a mile of the shore. Off this point

* Port Etches derives its name from Richard Cadman Etches, a merchant, who, with others, entered into a trading partnership (May, 1785), under the title of the King George's Sound Company, for carrying on the fur trade on this coast, having procured a licence for this purpose from the South Sea Company. The voyages of Captains Portlock and Dixon, in the *King George* and *Queen Charlotte*, in and subsequent to 1785, were undertaken for this company.

are some rocky islets, and there are some within the entrance (*Porpoise Rocks*), and until these are past there is no depth for anchorage. On the North side of the port is a lagoon, *Constantine Harbour*, within which was a Russian establishment, on a situation commanding the low narrow peninsula, and formed in 1793, when some ship building was being carried on.*

The entrance is $1\frac{1}{2}$ mile wide in its narrowest part, and thence the bay runs N.E. for $5\frac{1}{2}$ miles, terminating in a narrow shallow bay.

The narrow channel into Constantine or Brook Harbour passes around Phipps Point. This lagoon is about 2 miles long, with shallow water, but affording a channel of 12 ft. water nearly to Fort Constantine, in which the current sometimes runs at the rate of 4 knots. Off the entrance there is anchorage in 5 to 7 fathoms, even bottom, half a mile from the shore. Fish is plentiful.

Port Etches was visited by H.M.S. *Sulphur*, in 1837. In the account of the voyage is the following:—"This establishment of the Imperial Russian Fur Company consists of the official resident, eight Russians, and fifty Aleutian and other allies. It is calculated to stand a tolerable siege, under determined hands."

Port Etches might furnish a most complete harbour, if vessels frequented these regions, or a station should ever be required in so high a latitude. The currents, however, between it and Montagu Island render it difficult of approach; and the Russian commandant stated that many sunken rocks (but perhaps of 10 or 15 fathoms) lie off Cape Hinchinbrook. Capt. Belcher's observations make Vancouver nearly as much in error in longitude as he ascribes to Cook.

Phipps Point, the N.E. or opposite extremity of the peninsula, on which is the Russian establishment, is placed by Sir Edw. Belcher in lat. $60^{\circ} 21' 12''$ N., long. $146^{\circ} 50' 15''$ W.; but later observations place it 20 miles farther to the eastward. It is high water, on full and change, at $1^h 15^m$; rise, $9\frac{1}{2}$ ft.

Hawkins Island is to the N.N.E. of Hinchinbrook Island, and is about 20 miles long, N.E. by N. $\frac{1}{2}$ N. and S.W. by S. $\frac{1}{2}$ S. On its southern side is the channel before mentioned, which is contracted by the sand-bank on the S.E. shore to a narrow, difficult channel, against the southern shore of the island. Off the entrance of the passage between Hawkins and Hinchinbrook Islands is a shoal, and in the passage are some islets and rocks.

On the North side of Hawkins Island is *Port Cordova*, an arm extending from its N.W. point about 13 miles in an easterly direction. Within these limits are a bay and a small branch, in which are several rocks and rocky islets. These shores are in general low, ending in pebbly beaches, where

* Upon Garden Island Capt. Belcher found a pine that was marked by Portlock, July 22, 1787, and was very nearly destroying it.—(Belcher, vol. i., p. 73). At present the island is covered with pine trees, without many traces of the garden.

shoal water extends some distance, and renders landing at low tide very unpleasant. To the northward is *Port Gravina*. The S.E. point of its entrance is placed by Vancouver in lat. $60^{\circ} 41'$, long. $146^{\circ} 11\frac{1}{2}'$, and thence it extends about 10 miles to the N.E.

Snug Corner Bay is on the N.W. end of the peninsula separating Ports Gravina and Fidalgo. Its West point is in lat. $60^{\circ} 45'$, long. $146^{\circ} 35'$. Capt. Cook said it was a very snug place, with a depth of 3 to 7 fathoms, over mud.

Port Fidalgo is so named after the Spanish commander who visited it in 1790. It extends in a winding direction to lat. $60^{\circ} 55'$, long. $145^{\circ} 48'$; its width being about 2 miles, and its length 28 miles. Towards its upper end are some islands, and its shores are pleasingly diversified by trees. A small inlet runs in, 2 miles, in a N. by W. direction, at the N.W. point of Port Fidalgo, and $4\frac{1}{2}$ miles South from its West point is the South end of Bligh Island. The shores are also rocky. *Bligh Island* is 7 miles long N.W. by W. and S.E. by E., and some islands off its North end form the southern side of the entrance to Puerto de Valdes.

Puerto de Valdes was so named by Señor Fidalgo, and extends for 12 miles to the North, where a small brook, supplied by the dissolving snow and ice, flows into the arm, and from thence extends 5 miles in a N.E. by E. direction to its termination in shallow water. The port is from $1\frac{1}{2}$ to 3 miles in breadth. Its West point is called *Point Freemantle*, and is in lat. $60^{\circ} 57'$, long. $146^{\circ} 49'$.

Southward of Point Freemantle is an island 7 miles long, in a S.S.W. direction, and 3 miles broad; within it is a passage $1\frac{1}{2}$ mile wide, with two bays on the northern side.

Westward of this island is an arm extending about 4 leagues to the N.W. by N., and terminating at the foot of a continuation of the range of lofty mountains. It is, in general, about 3 miles wide, and its western coast terminates to the South, in *Point Pellew*, and from this the coast takes an irregular S.W. direction, 10 miles, toward the East point of a passage leading northward. The shores are low, and bounded by islets and rocks.

From Point Pellew a channel extends about 3 leagues in length, to the W.N.W. This in some places is a mile, and in others not a quarter of a mile broad; its West side is formed by *Esther Island*. At 4 miles N.W. by N. from its farther end is *Point Pakenham*, which is the S.W. point of Port Wells. This extends in a N. by W. direction, and terminated in a firm and compact body of ice. To the westward of the point is another unimportant bay, and hence the coast pursues a southerly direction, 5 leagues, to *Point Pigot*. The continent is here composed of a stupendous range of snowy mountains, from whose base low projecting land extends, jutting out into points, and forming the shores, which are thinly wooded with dwarf pines and stunted alders.

Point Pigot and *Point Cochrane*, opposite to it, form the entrance to *Passage Canal*. The principal branch extends from Point Pigot S.W. by W., 13 miles, and then S. by W., 4 miles farther, terminating in lat. $60^{\circ} 48'$. Here the head

of the inlet reaches within 12 miles of Turnagain Arm, at the head of Cook Inlet, hereafter described. The isthmus itself is a valley of some breadth, which, though containing elevated land, was very free from snow (in June), and appeared to be perfectly easy of access. By it the Russians, and Indians also, communicated with either of these extensive sounds. The other branch extends $2\frac{1}{2}$ leagues S.W. by S. from Point Cochrane, which is $1\frac{1}{2}$ mile E. by S. from Point Pigot. Eight miles E.N.E. from Point Cochrane is *Point Culross*, off which is an island about 3 miles from the shore, and about 4 miles long; and following the coast southward, for 6 miles, we arrive at an opening about 2 miles wide. From the South point of the entrance, 11 miles along a shore broken into small bays, lined by innumerable rocks, and exposed to the whole range of the N.E. swell from the sound, brings you to *Point Nowell*, in lat. $60^{\circ} 27'$.

Between this coast and the ocean are a considerable number of large islands, which lie generally in a N. by W. and S. by E. direction. The coast of the continent runs, but in a very irregular manner, in the same direction, to *Cape Puget*, in lat. $59^{\circ} 55'$, long. $148^{\circ} 3'$, this being the point where the shores of the main land form the seaward face.

From Point Nowell the main coast turns to S. by W. for about 11 miles, to a point where an arm extends first to W. by N., and then terminates to the S.E. by S., in a circular basin full of rocks; but about midway between the point and this are two arms extending 4 miles in a westerly direction. Before this coast is an island, following its direction at 2 miles distant, and $3\frac{1}{2}$ leagues long, forming a passage, but full of rocks. At $5\frac{1}{2}$ miles to E. by S. from the South point of the arm first mentioned is *Point Countess*, in lat. $60^{\circ} 13'$. To the West is a bay, about $4\frac{1}{2}$ miles deep, terminating in a compact body of ice that descended from high perpendicular cliffs to the water side. The coast southward of Point Countess forms the N.W. side of a narrow channel, 11 miles in length, in a S.S.W. direction. The North point of the southern end of this strait* is *Point Waters*; it has some rocks and breakers before it. This point is on the eastern side of *Port Bainbridge*, an inlet from the ocean, extending 18 miles in length from its entrance, in a N.W. by N. direction. From its being directly open to the ocean, although at this distance from it, the wind, when it sets up or down the channel, sends such a violent sea upon it, that landing is dangerous. *Point Pyke*, on the western side, is 6 miles from Point Waters. It is remarkable for its sugar-loaf form, and has some rocky islets off it. At 5 miles S.E. by E. from Point Pyke is *Point Elrington*, the south-eastern

* It was in this strait that Vancouver's party encountered a violent storm, June, 1794; a very heavy gust of wind brought down from a considerable height on the mountain side an immense mass of earth, trees, and frozen snow, which fell at a distance not exceeding a hundred yards from the assembled party. They observed in other places the effects of similar storms, which will serve as a warning to any one on these shores.

point of Port Bainbridge, and the south-westernmost part of a high, rugged cluster of islands. Opposite to Point Elrington is Cape Puget, before mentioned, on the main land.

The island, of which Points Elrington and Pyke form a portion, is high and rugged, and about 6 leagues in length, in a general N. by W. direction. *Latouche Island* lies off its eastern side, separated by a channel $1\frac{1}{2}$ mile broad. Its northern point is named *Point Grace*. *Knight Island* lies to the northward of these, and is upwards of 9 leagues in length in the same direction; and beyond this, again, are some others of less dimensions.

Between this and Montagu Island is *Green Island*, so named by Cook, in May, 1778, from its being entirely free from snow, and covered with wood and verdure. The islands near the open sea are, as before stated, elevated and rocky; those within are low ones. At 1 or $1\frac{1}{2}$ league N.W. by N. $\frac{1}{2}$ N. from the North point of Green Island, are some ledges of rocks, some above and others under water, making it very unsafe plying in this neighbourhood.

MONTAGU ISLAND is the largest and principal island of Prince William Sound, it being, according to Vancouver's survey, 46 miles in length, from North to South; its average breadth is 7 miles. Cape Clear, its South point, is in lat. $59^{\circ} 46'$, long. $147^{\circ} 40'$. The passage between it and Port Etches is $5\frac{1}{2}$ miles wide, forming the principal entrance to the sound, and through it the tides rush very strongly.

The passage on the inside, or to N.W. of the island, forms an entrance into Prince William Sound, between it and Latouche and Green Islands, of course varying in breadth. On the N.W. shore of the island are two or three open anchorages protected from the S.E. The two bays, one named by Portlock *Hemming Bay*, and the other *M'Leod Harbour*, are stated by Mr. Whidbey to be very exposed anchorages, and nothing more than stopping places in navigating this channel.

Port Basil, or *M'Leod Harbour*, is 12 miles within the S.W. point of Montagu Island, and nearly abreast of Latouche Island. Portlock says its outer points, Point Bryant on the South, and Point Woodecock on the North, are about 2 miles apart, and joined by a bank of 7 or 8 fathoms, black sand and mud, within which is a depth of 21 to 12 fathoms. Within it takes a turn to the North, round a point which is quite bold-to, and may be passed close. A ship can lie in $4\frac{1}{2}$ or 5 fathoms water, with the South point of the bay just shut in with this point, at about a cable's length from the shore. All ships coming into this harbour ought to keep the shore of Montagu Island on board as close as they can.

About 5 leagues from M'Leod Harbour, Portlock says he came to a deep wide bay, named *Hanning Bay*, where vessels may safely anchor in 10 to 20 fathoms, mud. A stream, frequented by salmon, enters its South part. Near *Green Isles*, 4 miles westward of Chalmers Harbour, the water shoals, 7 and 8 fathoms being frequently found by Portlock, with patches of kelp.

Port Chalmers is on the West side, and toward the North end of Montagu Island, *Point Gilmour*, its North point, is in lat. $60^{\circ} 16' N.$, long. $147^{\circ} 5' W.$ Two islets, and rocky patches with kelp, lie off the entrance, which is half a mile wide. The harbour thence extends about $1\frac{1}{2}$ mile to the N.E., and has a landlocked cove, 1 mile from the entrance, with good anchorage, in 7 fathoms, mud.

Vancouver says:—"The place of our anchoring in Port Chalmers can only be considered as a small cove, on a rugged rocky coast, very difficult of access or egress." *Stockdale Harbour*, too, is only a bay full of rocks, and of course not worthy of particular attention. The shores about Port Chalmers are in general low, and very swampy in many places, on which the sea appeared to be making rapid encroachments, the remains of the forests being seen below high-water mark. Off the entrance to the harbour are several lurking rocks, which make its approach very dangerous, as before stated. Great care is necessary to avoid them, as some are not always visible.

The approaches to this harbour, from the South, are also much incommoded by two small shoals midway between the South point of the harbour and a rugged rock that lies about a mile from the East side of the largest of Green Islands. The southernmost of these shoals has 6 fathoms least water, and the other, three-quarters of a mile north-eastward of it, has a small patch of weeds in 3 fathoms.

It is high water at Port Chalmers about one hour after the moon passes the meridian; the current sets southward, and there is no draught into the harbour. Springs rise 13 and $14\frac{1}{2}$ ft., the night tides rising above a foot more than those in the day.

The strait between Montagu and Green Islands, to the northward of Port Chalmers, is embarrassed by a line of sunken rocks, which are very steep-to, affording no indication of their proximity by the lead. From the N.W. point of Montagu Island a ledge of rocks extends half a mile. Off the North point of Green Island, 3 miles distant, is a ledge of rocks, and to the northward of these again is another. The N.E. end of Montagu Island is divided into bays or sounds, two of which appear capacious, but from their points of entrance (as well as within them) rocks extend a considerable distance. As this side of the island is greatly exposed to the prevailing winds, great caution ought to be observed in navigating near its shores.

From the N.E. point of Montagu Island its eastern shores run compactly to the S. by W. for 31 miles, to a low projecting point covered with wood. Off it lies a cluster of six rocky islets, chiefly composed of steep cliffs, nearly level on their tops, which may serve as a direction in thick or gloomy weather to the South point of Montagu Island, lying from them S.W. by S., distant about 16 miles. They are tolerably well wooded, and are not liable to be mistaken, particularly for the Chiswell Isles (about 63 miles to the S.W. $\frac{1}{2}$ S.), because those appear to be entirely barren.

From Cape Puget to Cape Elizabeth the shores have been well explored by Russian navigators, and their reports show that the coast line is broken by bays and coves, but none offering good anchorage, the water being deep close to the shores. The coast is rocky and mountainous, yet covered with wood.

Chiswell Isles are a group of naked rugged rocks, seemingly destitute of soil and any kind of vegetation. The centre of the southernmost group, named *Seal Rocks*, is in lat. $59^{\circ} 31'$, long. $149^{\circ} 2'$. From this, the easternmost, which is a single detached rock, lies N.N.E., about 3 miles distant; and the northernmost, which has several islets and rocks about it, lies N.N.W., 5 miles distant. *Blying Sound* of the Russians, called by Portlock *Port Andrews*, lies within Chiswell Isles.

Resurrection Bay, 15 miles N.E. of Chiswell Isles, is an extensive arm, 15 to 20 miles long, and 3 to 6 miles wide. The water is very deep, and the climate is represented to be severe. The Russian-American Company had a post here, and a ship-yard.

To the south-westward of Chiswell Isles the coast presents a broken appearance as far as *Pie Islands*, the South extreme of the southernmost of which lies in lat. $59^{\circ} 19'$, long. $149^{\circ} 51'$. This island, in several points of view, forms a conspicuous peak, and although not remarkable for its great height, yet, from its singular appearance, it is not likely to be mistaken in this neighbourhood, as it descends with great regularity from its summit to the water's edge. A group of rocks lying S.W. $\frac{1}{2}$ W., 4 miles from it, must be very dangerous in thick weather, as it is probably covered at high water, spring tides.

Between *Pie Islands* and *Point Gore*, a distance of 18 miles, the coast is in most parts very mountainous, and descends rather quickly into the ocean. *Point Gore* is placed by Vancouver in lat. $59^{\circ} 11'$, long. (corrected) $150^{\circ} 22'$. Towards the sea this projecting promontory terminates in an abrupt cliff, moderately elevated, and is connected to the main land by a low peninsula covered with trees. To the westward of the point is *Port Dick*, running 10 miles northward.

CAPE ELIZABETH, the S.E. point of the mouth of Cook Inlet, is placed by Vancouver in lat. $59^{\circ} 9'$, long. (corrected) $151^{\circ} 18'$. The coast here is composed of high land, before which lie the *Tchugatz Islands*, three large islands and some rocks. The cape is itself the largest of these, and the westernmost of them. To the S.W. of the middle island is a cluster of rocks, both above and below the water's surface.

Port Chatham, so named by Vancouver from his tender, is situated behind the island which forms Cape Elizabeth, and from that promontory extends to a point in a N. by E. $\frac{1}{2}$ E. direction $5\frac{1}{2}$ miles, and from thence it terminates in an excellent harbour, about 2 miles long S.W. by W. $\frac{1}{2}$ W. and N.E. by E. $\frac{1}{2}$ E., and 1 mile broad, affording secure and convenient anchorage. The passage into it, passing to the N.W. of Cape Elizabeth, is free from all obstructions

but such as are sufficiently conspicuous or easily avoided. The soundings in Port Chatham are tolerably regular, from 5 to 25 fathoms, the bottom a stiff clay; the shores in most places are a low border, very well wooded with pine trees and some shrubs.

The Chatham anchorage, off an excellent run of water, was found to be in lat. $59^{\circ} 14'$. The rise and fall of the tide, near the change of the moon, were 14 ft., but during neap tides not more than 10 or 11 ft. High water about an hour after the moon had passed the meridian; but greatly influenced by the form and direction of the winds. The Russian establishment, *Fort Alexandroffsk*, was in a bay to the westward of Port Chatham.

KENAY PENINSULA separates the two extensive inlets called Prince William Sound and Cook Inlet. There were several Russian establishments on its shores, and it is inhabited by a tribe which has given the name, Kenaiana, to all the Indians North of the Copper River, and West of the Rocky Mountains, except the Aleutians and Esquimaux. They are a proud and fearless race, but were represented by the Russians and those employed by the Telegraph Company, as peaceable and well disposed, but they are always ready to resist any affront or wrong.

COOK INLET.

This extensive arm of the ocean was discovered by Capt. Cook, in 1778, but he explored it imperfectly, supposing that it was much more extensive than it was found to be by Vancouver in 1794. Cook thought that it was the estuary of a great river, and as he did not name it, Lord Sandwich directed that it should be called Cook's *River*; but when Vancouver penetrated to its head, he properly called it Cook's *Inlet*. From the entrance the general direction of Cook Inlet is North, 160 miles, decreasing in breadth towards its head.

The entrance lies between Cape Elizabeth and Cape Douglas, 47 miles to S.W., and nearly midway between lie the *Barren Islands*, very high and barren, disposed in two principal groups, 13 miles in extent E.N.E. and W.S.W. The passage N.E. of them is called the eastern passage, and the currents rush through it with great velocity, causing great tide rips at certain times.

Point Bede, so named by Cook, May 26, 1778, lies 11 miles N.W. by W. from Cape Elizabeth, and is a lofty promontory, terminating in a low wooded point, guarded by some rocks. Off it the ebb runs at the rate of 2 knots per hour, and the tide is reported to rise 14 ft. From this the coast trends N.E. by N. $\frac{1}{4}$ N., with a chain of mountains inland extending in the same direction. The land on the coast is woody, and there seemed to be no deficiency of harbours.

Graham Harbour is 5 miles from Point Bede. The entrance, according to Portlock's sketch, is between *Russian Point* on the South, off which a rocky

shoal dries at half ebb nearly $1\frac{1}{2}$ mile out, and *Dangerous Point* on the North, $2\frac{1}{2}$ miles to N. by W. A reef extends 1 mile W. by N. $\frac{1}{4}$ N. of the latter, and detached rocks for three-quarters of a mile S. by W. $\frac{1}{4}$ W. of it. On Russian Point was a Russian station, and an Aleutian village, and an extensive shoal makes off for a mile. The general direction of the bay is East, $4\frac{1}{2}$ miles, then S.E. $\frac{1}{4}$ E., 2 miles, ending in extensive mud-flats, with some small streams, frequented by salmon. Safe anchorage may be had anywhere, and towards the head in 10 fathoms, mud. There are several projecting points on each side of the harbour, which form very good and snug bays, where a ship might, if necessary, be hauled on shore in the greatest safety. Both wood and fresh water are abundant.

At 1 mile within the entrance lies *Passage Island*, with a long reef extending over a mile S.W. $\frac{1}{4}$ S. from its S.W. point, nearly across the South passage to Russian Point, though Portlock says he examined this channel and found plenty of water. The passage on the North side of the island is about $2\frac{1}{2}$ cables wide, with 17 fathoms water, over mud. From the North shore, abreast the East end of the island, sunken rocks stretch about halfway across the harbour.

Coal Bay, on the North side, to the eastward of *Dangerous Cape*, is a pretty good one, carrying soundings in 14, 12, and 8 fathoms, fine black sand, less than half a mile in extent. *Cove Bay*, twice as large as Coal Bay, lies 1 mile E. $\frac{3}{4}$ N. from the latter, with good anchorage in 10 to 15 fathoms.

Captains Portlock and Dixon landed on the West side of Coal Bay, and in walking round discovered two veins of cannel coal, situated near some hills just by the beach, about the middle of the bay, and with very little trouble several large pieces were got out of the bank.

The best time to run into this harbour is as near low water as possible. Whatever danger there is may then be seen, either from beds of kelp, or the rocks showing themselves above water.

CHUGACHNIK, or Tschougatschouk Bay, lies to the N.N.W., and its N.W. extremity is *Anchor Point*, in lat. $59^{\circ} 39'$. At 19 or 20 miles N.E. by N. $\frac{1}{4}$ N. from the reef off *Dangerous Cape* is *Entrance Point*, the North point of the entrance to the bay, in lat. $59^{\circ} 37' 10''$, long. $151^{\circ} 22' 10''$. This point is low, and stretches halfway across the entrance, in which the depth is 10 to 27 fathoms. Two sunken rocks are reported to lie almost in the middle of the approaches, one at $5\frac{1}{2}$ miles S.W. $\frac{1}{4}$ S. from Entrance Point, and the other $2\frac{1}{2}$ miles S.W. by S. from the point. From this point the bay trends N. by E. $\frac{3}{4}$ E., 19 miles, to its head, but the last 4 miles are occupied by a broad flat. Eastward of Entrance Point is the anchorage bay, about $1\frac{1}{2}$ mile in extent, with 7 fathoms water. Abreast the anchorage is a seam of coal, 7 ft. thick. At 3 miles E. by N. of Entrance Point is an islet joined to the shore by a low sand tongue.

The climate of this bay is much preferable to that at Graham Harbour. Navigators report that they have anchored here in beautiful weather, when

they could see the fog and rain clouds in the vicinity of Cape Elizabeth. In cold winters, however, the inlet freezes nearly as far South as Anchor Point.

Between Entrance Point and Anchor Point, 21 miles to the south-westward, the coast runs nearly straight, and from hence, according to Vancouver's chart, the coast pursues a nearly straight direction, 60 miles, to *Fort Nicholas*, the Russian establishment, at the mouth of Kaknu River, 8 miles to the S.E. by E. of the East Foreland.

The S.W. limit of Cook Inlet may be placed at *Cape Douglas*, a long, low, sandy point, in lat. $58^{\circ} 52'$, long. $153^{\circ} 3'$. The coast hereabout is composed of a low tract of country, stretching from the base of very lofty mountains, wrapped in snow (May, 1794). Off the cape, 7 or 8 miles to the northward, lies a very low flat island, *Shaw Island*, off the N.E. point of which is a ledge of rocks. To the northward of the mountains forming the promontory of Cape Douglas, is a lofty, rugged ridge, connected by land less elevated, and forming a deep bay between the cape and the lower borders of Ouchouganat Island, or Mount Augustin. The shores of this bay, *Bourdieu Bay*, in most directions seem compact, but encumbered with large rocks and stones; the depth of water across it, North and South, is from 9 to 12 fathoms.

OUCHOUGANAT ISLAND, or *Mount Augustin*, is a very remarkable island, rising with a uniform ascent from the shores to its lofty summit, which is nearly perpendicular, to the centre of the island, inclining somewhat to its eastern side, and being in lat. $59^{\circ} 22'$, long. $153^{\circ} 15'$. It is about 9 leagues in circuit, and forms a lofty, uniform, conical mountain, presenting nearly the same appearance from every point of view, and clothed with snow and ice down to the water's edge. The width of the passage between it and the main land is about 6 miles.

Advancing northward along the shores of the main land, it will appear indented and broken into small coves and bays. In lat. $59^{\circ} 42'$ are three islets, against the shore, behind which there is appearance of anchorage and shelter. There is nothing remarkable on the coast* until we come to the northward of lat. 60° , where there are two openings, the northern of which is the principal. It runs to the W.S.W., and then S.S.W. towards the foot of a conspicuous

* The weather now (April 18, 1794), though extremely cold (the mercury standing at 23°), was very cheerful, and afforded us an excellent view of the surrounding region, composed, at a little distance from the river, of stupendous mountains, whose rugged and romantic forms, clothed in a perpetual sheet of ice and snow, presented a prospect, though magnificently grand, yet dreary, cold, and inhospitable. In the midst of these appeared the volcano, near the summit of which, from two distinct craters on its south-eastern side, were emitted large columns of whitish smoke, unless, as was supposed by some on board, it was vapour arising from hot springs in that neighbourhood; but how far this conjecture was consistent with the severity of the climate at the top of that lofty mountain is not within the limits of my judgment to determine.—*Vancouver*, vol. iii., p. 100.

volcano, *Iliaminsk Peak*, 12,066 ft. high, which lies in lat. $60^{\circ} 6'$, long. $153^{\circ} 15'$.

From the mouth of this opening to the West and East Forelands, where the breadth of Cook Inlet is considerably contracted, the distance is 43 miles, the distance between its shores at this part being about 30 miles. In the intermediate space lies an island, named by the Russians *Coulgiak Island*, which divides the inlet here into two channels, the N.W. of which is much encumbered by dangerous and extensive shoals. The island itself is about 13 miles long, N. $\frac{1}{2}$ E. and S. $\frac{1}{2}$ W., and is narrow. Vancouver landed on the South point of a shallow bay on its N.W. side, towards its S.W. extremity. The snow, which was lying very deep on the ground (April 17, 1794), confined their walk to the beach, on which was lodged some small drift wood, and on it they found some pieces of coal, resembling cannel coal. The more important part of this island to the navigator is a dangerous shoal, which extends, in its direction from the S.W. end, for the distance of at least 2 leagues. From the great variety of soundings on passing over it, it appears to be very uneven, as in several instances the ship struck violently on some detached pieces of rock, so that it is infinitely more dangerous than a mere spit of sand. This shoal continues all along the S.E. shore of the island to 2 miles distance off it.

Abreast of the S.W. point, on the West shore, is *Point Harriet*, which is a moderately high steep cliff. Off the point a shoal extends a league, on the outer edge of which there is only 3 fathoms. To the N.E. of this again, the channel between the island and the western shore has some extensive shoals. One lies off the middle of the island, and stretches to the northward; it is between 6 and 7 miles from the main land, and is nearly a league from the West side of the island.

Beyond this the shores of Cook Inlet are comparatively low, or only moderately elevated, jutting out into three remarkable steep cliffy points, named the East, West, and North Forelands; the two former forming the Narrows. A small shoal lies between the N.E. end of *Coulgiak Island* and the Narrows, bearing from the former N.N.E., distant 6 miles.

The *West Foreland* is in lat. $60^{\circ} 42'$, long. $151^{\circ} 25'$, and is about $8\frac{1}{2}$ miles S.W. by W. $\frac{1}{2}$ W. from the East Foreland. A rock, visible only at half tide, lies about a quarter of a mile from the extremity of the point.

Between the West Foreland and the North Foreland, both of which are on the western shore, the coast forms a spacious open bay, called by Portlock *Trading Bay*. At the head of this was a Russian establishment. Shallow water lies the shore in the southern part of this bay.

The S.E. shore, eastward of the East Foreland, forms a shallow bay, between it and a point 6 miles N.N.E. above it, with soundings of 7 and 8 fathoms within a convenient distance of the shore, sheltered from the East, South, and S.W. quarters. Beyond this point, and between it and a point lying 7 miles S.W. by S. $\frac{3}{4}$ S. from Point Possession, a distance of 21 miles, the outer bank

forms a perfect labyrinth of conical rocks, detached from each other on a bank of sand and small stones, extending 1 and $1\frac{1}{2}$ league from the shore. These rocks are of different elevations, and few of them are of sufficient height to appear above high-water level. This very extraordinary rugged region appears to join to the southern side of the shoal on which Cook's ship, the *Resolution*, grounded in 1778. This shoal extends halfway over the strait, and its outer end is about 9 miles nearly N.N.W. from the East Foreland.

The North Foreland is in lat. $61^{\circ} 4'$, long. $150^{\circ} 40'$, and on it Vancouver found the Russian factory. For 2 leagues to the N.N.E. of this, along the western shore, tolerable anchorage is found. But this space is greatly exposed to the East and S.E. winds, the prevalent and most violent in this country. From hence the shoals gradually stretch to the distance of 5 miles from the shore, until they join Point Mackenzie.

Turnagain Island lies at the head of the more extensive part of Cook Inlet; its West end is in lat. $61^{\circ} 8'$. It is about $3\frac{1}{2}$ miles long, N.E. $\frac{1}{2}$ N. and S.W. $\frac{1}{2}$ S., and $1\frac{1}{2}$ mile broad, lying in the entrance of a branch diverging from the main inlet in a N.E. direction. Its entrance lies between Point Mackenzie on the North, and Point Woronzow, S. $\frac{3}{4}$ W., 2 miles from it. Cook's vessel penetrated this inlet a short distance, but left its termination undiscovered. Vancouver anchored 5 miles above its entrance, and found that all above him became, at low water, a succession of dry sand-banks, occupying the whole of the space up to its head, 18 miles farther on, in lat. $61^{\circ} 29'$, long. $149^{\circ} 7'$. At high tide it becomes an extensive sheet of water.

Turnagain Arm, the southernmost branch, is the principal. It was called by Cook *Turnagain River*, and by Vancouver *Turnagain Arm*, he having decided its real character. Its entrance lies between Point Campbell, which is S. $\frac{3}{4}$ E. 4 miles from Point Woronzow, and Point Possession on the southern shore. At 14 or 16 miles above these the shores converge again, up to which points they are 3 or 4 leagues asunder, but they cannot be approached on account of the shallow flats, and a shoal also lies in mid-channel.

The tide here rises 13 ft. perpendicularly, so that at low water the remaining portion of the arm is dry, or nearly so. It extends 22 miles above these points, and thus approaches to within 12 miles of the head of Passage Canal, in the N.W. part of Prince William Sound, described on page 645. Across this isthmus the Russians and Indians communicated with these two extensive inland waters, as there mentioned.

The time of high water in the N.E. arm is about six hours after the moon passes the meridian, and the rise and fall at springs is estimated at about 27 ft.

THE KODIAK ARCHIPELAGO.

The **KODIAK** (or **Kadiak**) **ARCHIPELAGO** was first seen by Behring, on his voyage of discovery, on returning from the American coast, in 1741. They were seen in 1763 by the Russian merchant Glotoff. In 1768, Chelighoff took possession of them in the name of a company of merchants for the trade in furs, of which he was the chief; and, in 1799, they were granted in full possession to the Russian-American Company.

The archipelago is composed of two principal islands, Kodiak and Afognak, and several smaller islets in their neighbourhood, separated from the coast by Petries or Chelikoff Strait, 25 miles wide.

Kodiak (or Cadiak, as it is called by Lisiansky) is very mountainous and surrounded by deep bays, into which a number of small rivers fall. The country is in general too elevated for settlement, and is, besides, for the greater part of the year, covered with snow. The climate is by no means agreeable; the air is seldom clear, and even in summer there are few days which may be called warm. The weather, indeed, depends entirely on the winds; so long as they continue to blow from the North, the West, or the South quarters, it is fine; when from other points of the compass, fogs, damps, and rain are sure to prevail. The winters very much resemble what is felt in Russia in a bad autumn, which is, however, not without exceptions.

The native animals are few, consisting of bears, foxes, ermines, &c. Birds are much more numerous, both in numbers and variety. Kodiak also abounds in fish, such as halibut, cod, flounders, &c., and salmon, which last come into the rivers, from May to October, in great abundance. The marine animals were formerly much more numerous, but from the indiscriminate slaughter they have been much thinned. Of late years, however, owing to the regulations for preserving them, they have again increased in number. Fur seals were formerly one of the staple products of the group. But the article for which it is now best known is ice, which is carefully prepared, for the Californian and other markets, in the bay of St. Paul.*

The population is small, compared with the size of the islands; they were estimated at a total of 4,000 by Lisiansky, in 1805. It was stated that, previous to the arrival of the Russians, it was more than double this. Chelighoff

* The Ice Company was formed at San Francisco, and they leased from the Russian-American Company the privilege of obtaining ice from St. Paul's. This concession was the subject of a special clause in the treaty, and the place has been fully utilized by the proprietors for this essential article. The ice was cut from an artificial lake, which had an area of about 40 acres. The labourers were all natives of the Aleutian Islands, and were principally engaged for three or four months of winter, while the ice is firm, in cutting it up and storing it for summer consumption. From here it was exported to every part of the Pacific, but chiefly to San Francisco.

stated that he subjected 50,000 men to the crown of Russia which is manifestly an exaggeration. They are a family of the Aleutians, resembling, in many respects, the Southern Esquimaux. They are generally kind and well disposed, and not entirely wanting in industry. By the introduction of schools and churches among them, the Russians have done much toward reducing them to a state of civilization.*

KODIAK, as before stated, is high, hilly, and very much intersected. Its greatest length is about 85 miles in a N. by E. $\frac{1}{2}$ E. and S. by W. $\frac{1}{2}$ W. direction, and its average breadth may be assumed as 45 miles. The shore, on all sides of the island, is indented with a great number of large and deep bays, which contain excellent harbours. That of Chiniatskoy is the largest, and at the same time the most important; for it is in the bottom of this bay that the establishment of the Russian-American Company, formerly the principal in the Pacific Ocean, was founded. This is the town and harbour of St. Paul. It is, therefore, the only port frequented by strangers, and we shall be more particular in its description.

CHINIATSKOY BAY is formed by Cape Greville or Chiniatskoy on the South, and Long or Barren (Sterile) Island on the North, an opening of about 7 miles in a N.W. $\frac{1}{2}$ N. and S.E. $\frac{1}{2}$ S. direction. It is 6 miles deep, and its S.W. portion is filled with rocks. On its North side are several islands, which shelter the harbour of St. Paul.

The frequent and lasting fogs which occur here would render the approach to this bay very difficult, if it were not for the island named *Ougak*, lying about 10 miles S. by E. $\frac{1}{2}$ E. of Cape Greville, and $2\frac{1}{2}$ miles from the land. This being the only island on the East coast to the southward of the bay, it becomes an infallible point of recognizance on approaching it.

The HARBOUR of ST. PAUL.—The West side of the harbour is broken by rocky bluffs, stretching from *White Spruce Cape*, which lies on the West side of the northern entrance, to the head of *Women Bay*, a distance of nearly 12 miles. The town of St. Paul is $3\frac{1}{2}$ miles from the cape, and 2 miles within the cape is a small cove, *Chagavka*, the West point of which, according to the U.S. survey of 1867, is in lat. $57^{\circ} 47' 57''$ N., long. $152^{\circ} 19' 34''$ W.

The harbour of St. Paul is excellent in every respect; the depth 5, 6, and 7 fathoms, good holding ground. Properly speaking, it is a narrow channel, formed by Proche or Near Island, which will hold but few vessels at a time. The channel abreast the town is not over 250 yards wide, and has some mooring buoys in it. The length of this narrow part is nearly a mile. At the town

* Many particulars of the group, in addition to those contained in the accounts of the Russian discovery by Dr. Coxe, and Pallas, will be found in Lisiansky's Voyage, chapter x., p. 190 *et seq.*; Billing's Voyage, by Martin Sauer; Langesdorff's Travels; Cook's Third Voyage, vol. iii.; and Vancouver's Voyage, vol. iii. These will give a good idea of the condition and resources of this inhospitable country. See, also, the note on pp. 664-5.

there are about 100 log houses, with a Greek church. It is high water here, on full and change, at 11^h 47^m; the mean rise and fall is 12 ft.

The West shore of Wooded Island is five-eighths of a mile distant from the shore, forming the outer anchorage, which is equally well sheltered and secure. Vessels can anchor off Chagavka Cove in 15 fathoms. To the southward of St. Paul another anchorage is formed by Near Island and other islands, with from 4 to 10 fathoms, but this is not often used, as the southern approach to it from the bay is contracted by rocks.

Wooded Island is about 2½ miles long N.N.W. and S.S.E., undulating, and partially wooded, rising to an elevation of about 250 ft. The shores are bold and rocky, but extensive reefs project off the North and South ends. On the West point are the Ice Company's works and a wharf. Abreast this point the counter-currents are said to run 6 miles an hour. *Long or Bars Island*, 1 mile to the eastward, is nearly 4 miles long N.N.E. and S.S.W., with extensive reefs off its North and South points. On its West side, 1 mile within the N.W. point, is the opening to a landlocked harbour, with from 3 to 10 fathoms in it.

The port of St. Paul has two entrances; one from the South, by the Bay of Chiniatskoy; the other, from the North, passes through the outer road. Neither is dangerous if the wind be favourable, and the weather sufficiently clear to distinguish the shores around the port; but it should not be approached during the night or in fog, for there are no lights, and the currents may carry you easily on to the shoals and rocks, which are abundant on all sides.

Both channels have dangers in their approaches. *Williams or Vasilief Reef*, a sunken breaking ledge, lies about 3½ miles North of the North end of Long Island, and midway between it and another reef, three-quarters of a mile off the point, is *Kadiak Rock*, a sharp pinnacle, with only 10 ft. water on it. A breaker bears about N.N.E., 2½ miles from the East end of the island.

There are also several dangers off Outer Spruce Cape. Capt. Niebaum, of the Alaska Commercial Company, states that a breaker lies a quarter of a mile West of Round Lumpy Rock, or the Twins; also that a rock, awash at low water, and marked by kelp, lies half a mile N.E. by E. ½ E. from the Twins, and is named *St. George Rock*, from a schooner of that name being lost on it in the spring of 1881. *Hutchinson Reef*, stated to have 9 or 10 ft. least water over it, lies about a mile N.E. of Outer Spruce Cape, and extends half a mile farther in the same direction.

These and other known dangers may be avoided, in entering by the North channel, by not bringing the N.E. end of Near Island to bear anything southward of S.W. by S. ¼ S.

In the South approach to the harbour lies *Humpback or Sugarloaf Rock*, 18 ft. high, 3 miles S.E. ¾ E. from the South point of Long Island, with 10 and 20 fathoms close around it. Sunken rocks also lie off the South entrance of the channel between Wooded and Long Islands.

North Pacific.

A course W. $\frac{1}{2}$ N. from Humpback Rock, for nearly $4\frac{1}{2}$ miles, leads nearly a mile southward of the latter dangers, and when the South point of Wooded Island bears N. by E., distant $1\frac{1}{2}$ mile, a course about N. by W. will lead through in mid-channel between Wooded Island and the islands and dangers eastward of Near Island, into St. Paul outer roadstead.

A course N. by E. from Humpback Rock leads outside the dangers off Long Island, including the breaker lying about $2\frac{1}{2}$ miles N.N.E. of the East end of the latter.

The following are Capt. Golownin's directions.

As soon as you have cleared Cape Chiniatskoy, you find before you a rock, called *Gorburn*; steer N.W. $\frac{1}{2}$ W. or N.W. $\frac{3}{4}$ W., true, and you will soon see ahead a small high island, *Toporkowa*, upon which you must be careful to direct your course. This island will show you the direction of the current; steer right upon it, leaving to starboard *Barren Island*, and then the channel which separates it from another, called *Woody Island*. When abreast of the South point of the latter, which may be readily known by the rocks surrounding it, bear to the North, ranging along the western shore of Woody Isle as near as possible, paying attention to the soundings, which diminish regularly on either side up to the entrance of the port. Following these directions, if the wind be not contrary, and carrying short sail, you may pass, without a pilot, the shoals on the western side near two isles, and reach the entrance of the port.

If, after passing along the West coast of Woody Isle, the wind or other obstacles prevent an advance, you may anchor in perfect security until the weather becomes more favourable. In case a vessel may have entered the bay, and the wind will not allow her to follow the foregoing route, and it is absolutely necessary that she should reach the port, she will find a good shelter very near *Steep Cape*, on the western side of the bay. In this case, after nearing *Gorburn Rock*, run directly for this cape, or to W. $\frac{3}{4}$ N., until a remarkable jutting point bears W.N.W.; it is readily distinguished on this low coast by its elevation, and its peaked form. As soon as *Steep Cape* is passed, change the course towards the starboard, to anchor under *Toporkowa Island*, from whence you may readily reach the harbour, either under sail, or by towing.

To enter the harbour of St. Paul by the northern passage, steer for Cape Pine; then, being near to this cape, which ought to bear about N.W., distant a mile or half a mile, run into the middle of the channel between Kodiak and Woody Isle, carefully observing not to go into less than 18 or 20 fathoms depth, steering directly for the islands before mentioned, to the West of Woody Isle, until the town of St. Paul is seen; you may then enter the port itself, or rather anchor in the outer road. The best anchorage is under Woody Isle, in 13, 14, or 15 fathoms, sand. Nearer the port the bottom is of mud, but here you are not so well sheltered as under Woody Isle.

If you wish to enter the port under sail, you must take care of the contrary

current, or have good cables; the breadth of the harbour not allowing you to bear up, you must drop anchor when under way. In the summer it would be better to anchor in the road, mooring in the direction of the tides, the flood running to N.E., and the ebb to S.W. The starboard anchor ought to be laid towards S.W., and the port anchor N.E., having an open hawse for N.W. and West winds, which blow strongly and in gusts. The tides change regularly every six hours.

Igatskoy or Ighakchi Bay.—To the South of Cape Greville, or Tolstoy (great), is Cape Tonkoy (small) of the Russian charts. It forms the N.E. point of *Igatskoy, Igakchi, or Ihak Bay*, a deep inlet of 16 miles to the West, but only $2\frac{1}{2}$ miles in breadth. There are some good harbours in it, especially one lying in the S.W. part. In the bay the Russian-American Company had an establishment. In entering, keep close to the South shore; the North is bestrewed with rocks.

At 12 miles to the S.W. from Igatskoy Bay is *Kiloudenskoy or Kiluden Bay*, where the Company also had an establishment. It is properly composed of two bays, either of which affords shelter.

In the S.E. part of Kodiak, to the S.W. of the last-named bay, lies *Saltchidak or Siachladak Island*, which is nearly 20 miles broad S.S.W. and N.N.E. *Cape Barnabas* of Cook is the N.E. point of this island.

Two-headed Point is on a small island, 8 miles S.W. $\frac{3}{4}$ S. from the S.W. point of Saltchidak Island, and is the northernmost of four isles that must be doubled before entering the Port of the Epiphany. *Epiphany Bay* is small, only a mile in circumference, and 60 yards in the opening. The depth is 10, 8, 7, and $4\frac{1}{2}$ fathoms, muddy bottom.

The southern point of Kodiak was called by Cook *Cape Trinity*. At $11\frac{1}{2}$ miles to S. by W. of Cape Trinity lie three islands, named by Cook *Trinity Isles*; they are so close together that they might almost be considered as one island; together they are about 30 miles in length, N.E. and S.W. On the Russian charts the eastern is called *Sitchunak*; the western, and largest, *Tugidak*.

The western shore of Kodiak is but little known. To the westward of Cape Trinity is *Alitok Bay*, where the Company had an establishment. The westernmost point of Kodiak, *Cape Ykolik*, in $57^{\circ} 14' N.$, lies N.W. $\frac{1}{4}$ W., 38 miles, from Cape Trinity; and at 18 miles N.N.E. of it was the Company's establishment, named *Karlouk*. It is from here that the baidares destined for the opposite shore departed, the strait of Chelighoff being narrowest here.

At 12 miles to the N.N.E. of Karluk is *Ooujak or Ohiak Bay*, a deep indentation, extending 27 miles in a S.E. by E. direction, the distance between its head and that of Kiloudenskoy Bay, on the opposite side of Kodiak, being only 8 miles.

The N.W. point of Kodiak is in about lat. $57^{\circ} 28'$, and 2 miles from this

point lies the extreme of North Island, which extends 15 miles East and West. This is separated by a narrow channel from Afognak Isle.

The northern coast of Kodiak, North Island, and the South part of Afognak, form a channel 20 miles long and 2 miles wide, in which 10 to 20 fathoms water is found.

About 4 miles off Cape Whitsunday, at the East end of Afognak, is an island 8 miles in length, named by Behring *Cape St. Hermogenes*. The Russians named it *Evratschey*, the name of a small fur-bearing animal, very abundant there.

Chelighoff or Chelekhoff Strait.—Cook called the North entrance of Chelighoff Strait Smoky Bay. It separates Kodiak from the continent North of the peninsula of Aliaska, and derives its name from the Russian commander who first brought the inhabitants of the adjoining countries under subjection.

In 1832 it was examined and surveyed by Mr. Wassilieff, an officer of the Russian navy, in the service of the Russian-American Company. This showed that the strait is narrower than was at first supposed; it does not exceed 25 or 30 miles.

Cape Douglas, which has been before described, is the N.W. limit of the strait. A great number of bays appear to afford good shelter; that called *Poualo* or *Cold*, in lat. $57^{\circ} 46'$, long. $155^{\circ} 30' W.$, is 5 miles distant from the great lake *Nanouantoughat*, from which the *River Ougagouk* flows to the North coast. This river has been adopted by Krusenstern as the northern limit of the peninsula of Aliaska.

The coast of the peninsula beyond this is described in the next Chapter, with those of the Sea of Behring which it encloses.

CHAPTER IX.

THE ALEUTIAN ISLANDS, AND BEHRING SEA.

THE extensive and inclement sea, whose eastern shores and islands are described in the present Chapter, derives its name from the celebrated navigator who first sailed in it, and made known to Europe the real character of the extremities of the New and Old Worlds.

The appellation of the Sea of Behring* was first and justly applied to it by Capt. Golownin. This replaced those by which it had been improperly designated, such as the Sea of Otters (Bobrovoïé), the Sea of Kamchatka, of Aliaska, or the Aleutian Sea.

The Government of the United States may do something to develop its resources, which had previously been confined to a few fur-trading posts of the Russian-American Company, and therefore there has been but little inducement for a more minute examination of its shores than that given in the imperfect charts drawn up by Lütke and others. But the United States' whale fishery in this sea, as presently mentioned, has afforded, in former years, a most lucrative occupation for a large fleet. A brief account of the progress of our knowledge of this distant region will also show the degree of authenticity our descriptions may claim.

The Russian Czar, Peter the Great, to whom the possession of the half of a great continent still seemed not sufficient, drew up with his own hand, shortly before his death, the instructions for a voyage whose object was to ascertain whether Asia was separated from America by a strait, and then to extend the Russian dominion beyond such a limit, should nature have thus marked it.

But in these distant regions of this vast empire there were no means by which such an exploratory voyage could be organized. They were therefore sent from Russia. Vitus Behring and Alexoi Tschirikoff were chosen by the Empress Catherine to execute this part of the will of her great partner and predecessor

* In the Report on the Seal Islands of Alaska, 1881, by Mr. H. W. Elliott, pp. 161-2, the author shows that the correct way of rendering the famous Russian navigator's name into English is *Bering*. For the present, however, we have retained the spelling now in general use.

in power. The two ships destined for this expedition were constructed at Kamchatka, the first of their kind that had been seen in this the extremity of a land then scarcely known. They did not set sail from the mouth of the Kamchatka River until July 20th, 1728, and Behring shaped his course to the N.E., never losing sight of the Asiatic coast. On August 15th he reached lat. $67^{\circ} 18' N.$, at a point (now Cape Serdze Kamen) where the coast turned to the westward, from which he returned to the port whence he sailed, without having seen the American coast. He had thus entered the Icy Ocean without knowing it; he had solved the great problem, and posterity has imposed the name of Behring upon this strait; the reality supplying the place of the fabulous Strait of Anian.

Behring and Tschirikoff made a second voyage in 1729, but it yielded no new information.

A third time did the same commanders set sail from Kamchatka, June 4th, 1741; this time with the intention of making the American continent to the eastward. Behring then sailed through the chain of islands skirting the great peninsula of Alaska. On August 29th he anchored at the Schumagin Islands, and in the course of the next month he discovered part of the Aleutian Islands. By this time the commander was ill and decaying. The greater part of the crew, too, were attacked by that frightful disease, scurvy.

Behring's ships and crew were reduced to the greatest distress by the weather and sufferings they encountered. Worn out with these, they made for the island now bearing his name; but the ship was stranded. On November 9th the captain himself was brought on shore on a hand-barrow, and died on December 8th, 1741. "He was a Dane by birth, and had in his youth made voyages to the East and West Indies, when the glorious example of the immortal Emperor Peter the Great for marine tempted him to seek his fortune in Russia. It is a pity that it was his fate to end his life in such an unfortunate manner. He may be said to have been buried half alive, for the sand rolling down occasionally from the side of the ditch in which he lay, and covering his feet, he at last would not suffer it to be removed, and said that he felt some warmth from it, which otherwise he should want in the remaining parts of his body, and thus the sand increased to his belly; so that, after his decease, they were obliged to scrape him out of the ground, in order to inter him in a proper manner."—*Müller*.

Tschirikoff's voyage was less unfortunate than his commander's; but he had scarcely fewer hardships. He returned to Russia, after having explored part of the American coast.

Such was the success of the first Russian expeditions. They were followed at intervals by many others, among which the names of Giotoff, Synd, Krenitzin, and Levacheff, stand most conspicuous.

Our great navigator, James Cook, entered the Icy Ocean, and ascertained the exact nature of the continental separation first traversed by Behring in

August, 1778; and his second in command, Capt. Clerke, after his sad catastrophe at Hawaii, again penetrated to the icy barrier in July, 1779. The abortive Russian expedition, under Commodore Joseph Billings, an Englishman, made by order of the Empress Catherine II., in 1785 to 1794, did not penetrate the strait, one great object of the expedition, after having traversed the Sea of Behring. In 1817 Capt. Otto von Kotzebue examined and named most of the points on the American coast of Behring Straits.

The Asiatic coast, from East Cape to Kamchatka, is amply described from the admirable survey and examinations of Rear-Admiral Frederic Lütke. In 1826 the Russian corvettes, the *Moller*, Capt. Stanikowitch, and the *Séniavine*, under Capt. Lütke, were despatched to these seas, and examined almost the whole of the western shores, and to the account of this voyage we owe our descriptions.

To our own country we are principally indebted for the accurate knowledge we possess of the American shores. This is from the memorable voyage of H.M.S. *Blossom*, under Admiral F. W. Beechey, who minutely surveyed the eastern shores of the strait in 1826-7.

The vessels employed in the Arctic searching expeditions in 1846-54, in quest of intelligence of the party under Sir John Franklin, added something to our knowledge of the Aleutian Islands and the northern harbours. H.M.S. *Herald*, under Captain (afterwards Admiral) Kellett, the *Plover*, under Commander Moore, and the expedition in the *Enterprise* and *Investigator*, under Captain (afterwards Admiral) Collinson, in 1850, with others, may be specially noticed. But the account of the progress of these noble efforts belongs to other subjects.

One of the latest expeditions to this remote land is probably the most wonderful of all in its origin. Before the solution of the great problem solved by the successful laying of the Atlantic Electric Telegraph Cable, in the summer of 1867, the importance of telegraphic communication between America and Europe, led to the project started by Mr. P. D. Collins, of an overland connection from San Francisco, across Behring Strait, and thence through the Russian Empire to Western Europe. In 1865 the Western Union Telegraph Company of America, the largest corporation of its kind in existence, commenced the explorations of the proposed line, which was to go from the Fraser River to the upper course of the Yukon River, thence down its course to Norton Bay; thence across to the Asiatic shore, down which it was to be carried to the mouth of the Amoor River, to which the Russian Government have completed their telegraph system. This gigantic undertaking was placed under the command of Colonel Bulkley, U.S. Army, and employed several hundred explorers for nearly 2½ years, who examined 6,000 miles of country on both sides of the Pacific, and constructed a large portion of the line. When the intelligence reached the parties of the success of the Atlantic cable, this grand enterprise was at once abandoned, after an expenditure of three millions sterling. The narrative of Mr. Fredk. Whympers, who was attached to the

Yukon party, is one of the most interesting works on the Pacific, and has been before quoted in this work.*

The *whale fishery*, as before stated, is a very important feature of these Arctic Seas. All the early voyagers speak of the vast abundance of fish of all varieties, and specially of the whale. But it does not appear that this fact was much utilized till California came in the ascendant, when Capt. Boys, in his ship *Superior*, penetrated the Arctic Ocean through Behring Strait, in the summer of 1848. In that and the following two years three hundred whale ships came here, and brought home oil and whalebone worth nearly 17½ millions of dollars. Such a vast result could not be obtained for a series of years, but still the fisheries of cod, halibut, salmon, as well as of the whale, are of the greatest value.

The Aleutians are very distinct from all the other Indians of the N.W., and many of them bear a close resemblance to the less marked of the Japanese, so much so that the question at once arises whether this people has not been directly derived from shipwrecked inhabitants of Japan. They are a quiet, patient people, gifted with a great deal of ingenuity, and always trusted implicitly by the Russians.—*Mr. G. Davidson*, 1867.

Not a single tree has yet been seen on any of the islands of the chain West of Kodiak, except a few spruces brought from Sitka and planted at Ounalaska by the Russians about 50 years ago, and they have made scarce any appreciable growth since they were planted. Wherever cattle have been introduced they have prospered and grown fat on the abundance of rich nutritious pasturage. Grain, such as rye, barley, and oats, seldom or never mature, but potatoes, turnips, cabbages, beet, &c., thrive wherever the ground is thoroughly drained and has a southerly exposure.—*Cruise of the Cerwin*, p. 48.

It may be premised that the geographical descriptions are imperfect, and cannot be trusted in the same degree as those which precede this, but this is of the less importance, as these seas are rarely traversed except by those who are more or less intimate with its navigation.

Of late years more attention has been devoted to Alaska, and several explorers have added considerably to our knowledge. Among others, the authorities mentioned below have been consulted in preparing the information here given.†

* "Travel and Adventure in the Territory of Alaska, &c.," by Frederick Whymper, London, 1868.

† A full account of the explorations by the U.S. surveyors, Mr. G. Davidson and Mr. W. H. Dall, will be found in the U.S. Coast Survey Reports, 1867, pp. 187—329; 1872, pp. 177—212; 1873, pp. 111—122; 1880, p. 297, &c. In the "Deutsche Geographische Blätter," Bremen, Heft i., Jahrgang ii., 1878, pp. 38—43, and 84—101, is a valuable article by Mr. W. H. Dall, entitled, "Neuere Forschungen auf den Aleuten." There is also a very interesting account by M. A. L. Pinart, a French traveller, of a coasting voyage from

The **PENINSULA of ALASKA**, separating Behring Sea from the Pacific, is a remarkable tongue of land extending from the River Ougagouk, mentioned on page 660, to the Strait of Isanotsky, or Isannakh, separating it from Unimak, the easternmost of the Aleutian Archipelago, an extent of 330 miles; its breadth diminishing from 90 miles in the North to 25 miles in the southern parts. Its name (signifying "the land") has been applied by the Americans to the whole of their new territory.

From its configuration it may be regarded as a continuation of the Aleutian Islands. The first authentic notice of its shores was that given in the account of the third and disastrous voyage of Captain Cook, who examined, though but very slightly, both sides of the peninsula at different points. The southern side remained in the same imperfect state until the examination, previously noticed, by Capt. Wassilieff, in 1832. Its northern side, of which we shall speak hereafter, is somewhat better known.

From the *Bay of Poulo*, the north-eastern limit of the peninsula noticed above, Capt. Wassilieff's examination extended to a large bay in lat. $56^{\circ} 40'$, and abreast of Evdokeeff Islands. This bay has been named *Wassilieff Bay*. The space between Poulo Bay and this point contains a great number of bays, and all along the coast are numerous islands, of which we have no especial description.

Evdokeeff Islands were discovered by Behring on August 4th, 1741, and named by him in honour of the saint of the day. They form a group of seven islands, the three largest of which were called *Simidiin*, *Alexinoy*, and *Ageach*. Capt. Golownin determined the position of the southernmost island of the group as lat. $56^{\circ} 0' N.$, long. $156^{\circ} 22' W.$

A rock is marked on the charts to the S.W. $\frac{1}{2}$ S. of the outer island, in lat. $55^{\circ} 45'$; evidently a different position to those recorded by Cook as having been seen June 16, 1778, a cluster of small islets, or rocks, lying about 9 leagues from the coast, which would be in about lat. $56^{\circ} 3'$, long. $158^{\circ} 0' W.$ They are now named *Lighthouse Rocks*.

St. Stephen Island, of small extent, is supposed to have been discovered and thus named by Behring. Krusenstern places it in lat. $56^{\circ} 10' N.$, long. $155^{\circ} 30'$. There is some confusion here respecting the discoveries of Behring, Tschirikoff, and Cook.

Oukamok, or *Tschirikoff Island*, was probably discovered by Vancouver, April 4th, 1794, and named by him after the companion of Behring. It appeared to form a somewhat irregular, four-sided figure, about 30 miles in circuit,

Unalaska to Kadiak, in the "Bulletin de la Société de Géographie," Paris, December, 1873. See, also, "The Arctic Cruise of the Revenue steamer *Corwin*, in 1881;" U.S. Government Printing Office, Washington, 1883; containing observations on Glaciation, Natural History, &c.

North Pacific.

having from its western part, which is low and flat, and which had the appearance of being insular, a remarkably high, flat, square rock, lying in a S.W. direction, at the distance of 3 miles, between which and the island is a ledge of smaller rocks. Its S.E. parts consist of high, steep cliffs, which were covered with snow; but on its western side, which is considerably lower, this appearance was not so general.

Of this part of the coast of the peninsula, as before stated, our knowledge is very scanty. Capt. Cook, who is almost the only navigator who tells us anything about it, says:—"For some distance to the S.W. (of Foggy Cape) this country is more broken or rugged than any part we had yet seen, both with respect to the hills themselves, and to the coast, which seemed full of creeks, or small inlets, none of which appeared to be of any great depth. Perhaps, upon a closer examination, some of the projecting points between these inlets will be found to be islands. Every part had a very barren aspect, and was covered with snow from the summits of the hills down to a very small distance from the sea coast."

SCHUMAGIN ISLANDS.—This group, which is the next considerable collection westward of the Evdokeeff group, according to Captain Lütke, is composed of fifteen islands, and seven smaller islets, among which are several small harbours. They received the name of Schumagin (Choumaguine) from Behring, in memory of one of his sailors who was buried here. The two largest islands of the group are *Ounga* and *Nagay*. The first extends about 18 miles S.E. by E. and N.W. by W., with an irregular breadth; its northern extremity is in lat. $55^{\circ} 22'$. *Nagay* Island, with a N. $\frac{1}{2}$ E. and S. $\frac{1}{2}$ W. direction, is about 28 miles in length. Besides these islands, Admiral Sarytscheff names those of *Kagai*, *Sajouliucktusigh*, *Nuinak*, *Tagh-Kiniagh*, and *Kiuniutanany*; all these, and several others not named, lie very close together. *Kagay* Island, according to Sarytscheff, ought to be placed in lat. $55^{\circ} 5' N.$, long. $160^{\circ} 33' W.$

The state of our knowledge respecting this group may be summed up in a few words: it is very imperfect and unsatisfactory. There is no apparent analogy between the remarks of any two observers. Under these circumstances we shall confine our extracts chiefly to that of *Ounga* Island, on account of the fact of coal existing on it.*

Ounga is the largest of all, and the westernmost of the group. According to the observations of *Stépanoff*, of the Russian Company, its South part is in lat. $55^{\circ} 11'$. This island is mountainous and clifty, particularly on its South coast, but the N.W. side extends in a plain, which terminates in the low cape called *Tonkoi*. The island has three bays; the largest, *Zakharovskaia*, is on

* This group was visited by the U.S. schooner *Humboldt*, in 1872, and the notes made by Mr. W. H. Dall, will be found in the U. S. Coast Survey Report, 1872, pp. 192—200. They are too voluminous to insert here.

the N.E. side; it is open to the N.E., but the anchorages may be kept; here the vessels of the Company formerly wintered. The second, on the East side, penetrates considerably into the land, but it has very little water. On this bay stands a village, called by the Russians *Delarovskoi*, and by the Aleutes, *Ougnagak*. The third is on the South coast.

At the entrance of Delarovskoi Bay M. Pinart visited a curious sepulchral cavern, called *Atnanh*, containing the remains and numerous interesting relics of the ancient Aleutian inhabitants.

On the West side of *Zakharovskai*a Bay, or Coal Harbour, there are, in two places, some beds of coal, arranged in perfectly horizontal strata, at 100 yards above the level of the sea. They have been worked.*

Between *Ounga* and *Popoff Island*, to the eastward, is a strait varying from half a mile to 2 miles wide. There are several indentations on the eastern shore of *Popoff Island*, the most northern of which is *Humboldt Harbour*, which has been entered by several fishermen, who report fair holding ground and protection, with 7 fathoms water. Excellent water and plenty of driftwood may be obtained here. The U.S. schooner *Humboldt* anchored here.

Simeonoff Island, the easternmost of the group, is composed of two clusters of hills, and the whole of its shores bristle with reefs and shoals, extending several miles off. *Chernobour Island*, to the S.S.W., resembles *Simeonoff* in most respects, but is narrower and longer.

Nearly due West, *true*, from *Ounga*, on the coast, is the *Belkoffski* or *Squirrel* settlement, the largest village on this coast.

Between the Schumagin Islands and the western extremity of *Alaska*, the coast is bordered with a large number of small islands. Admiral *Sarytscheff*, who passed here, says in his journal that eight of them, of which he gives the names, are larger than the rest.

Nanimak Island, nearly the westernmost, is stated to lie 4 leagues to the northward of *Sannagh* (presently described). To the S.E. of it lie a quantity of small islets and rocks above water. *Animak*, or *Reindeer Island*, lies 6 miles to the northward of *Nanimak*. To the S.E. and East of this island there is a group of rocks and islets similar to those projecting to the S.E. from *Nanimak Island*. *Lialiuskigh* lies to the north-eastward of *Animak*, at the distance of 14 miles.

Two islands, without names, lie at the distance of 3 miles from this; one to the northward, the other to the north-eastward. *Kuagdogh* lies to the eastward, 2 miles off from the fifth island. *Kitagotagh* lies towards the E.S.E., at the distance of 3 miles from the last-named island. *Ounatchogh* lies 2 miles

* The coal is a lignite of poor quality, and not abundant. The seams have been worked, and the produce used on board the Russian-American Company's steamers, but not to any great extent. The place was visited by the United States' Telegraph Expedition in 1865.—*Mr. F. Whymper*.

to the north-eastward of the preceding; between these two last there is a high and pointed rock.

Cook passed these islands June 20th, 1778, and estimated their distance from the coast as 7 leagues. Opposite to Ounatchogh Island, on the coast of Alaska, is a very lofty volcano, the summit of which fell, in 1786, during an eruption. It is, perhaps, the same mountain that Cook saw emitting smoke.

Sannak, *Sannagh*, or *Halibut Island*, which is the westernmost of those on the coast of Alaska, received its last name from Cook, on account of a great take of that fish. It is separated from the coast by a channel 12 miles in breadth, and is surrounded with naked rocks and islets. "This island is 7 or 8 leagues in circuit, and, except the head, the land of it is low and very barren. There are several small islands near it, all of the same appearance; but there seemed to be a passage between them and the main, 2 or 3 leagues broad."—(Cook). *Halibut Head* is a round hill in the centre. About 15 miles eastward of these islands is a cod-bank of 38 fathoms.

The **STRAIT of ISANOTSKOY**, or *Isannakh*, separating Alaska from the Aleutian Islands, was known to exist prior to 1768. The upper or northern part of the strait extends for 12 miles N.N.W. and S.S.E.; its breadth does not anywhere exceed 4 miles. At its northern extremity, that is, between Alaska and the N.E. point of Ounimak (behind which lies Krenitzin Bay), the strait is not more than 2 miles broad; and, moreover, is obstructed by a large number of banks. The N.W. entrance of this strait is extremely difficult, on account of the sand-banks, and the currents which are felt during the ebb and flood tides. That to the S.E. is very much easier, and the soundings do not give less than $4\frac{1}{2}$ fathoms; but we have no authentic particulars of it.

The lower part of the strait, that is, the portion between Ounimak and Ikaton, or Ikatok Island or Peninsula, is 8 miles long by 4 miles broad. This breadth, however, is contracted to one half by *Kitenamagan Island*, lying half a mile from Ikaton. On the eastern side of the strait is the village of *Morjovy*.

M. Pinart discovered that *Ikatok*, marked on the charts as an island off the East end of Ounimak, is really a peninsula; his canoes were carried across the isthmus.

From the North end of the Strait of Isanotskoy, the coast of Alaska runs to the north-eastward, in nearly the same direction as the southern coast of that peninsula. This will be described presently, in connection with the remainder of the coasts of the Sea of Behring. The Aleutian Archipelago, forming, as it were, a broken continuation of the peninsula, will follow.

THE ALEUTIAN ARCHIPELAGO.

It is to the celebrated Behring, as we have mentioned regarding the Kodiak Islands, that Russia owed the discovery of the Aleutian Islands. It was during his return from the coast of America, in 1741, that he discovered several of them, now known under the names of Semitsch, Kiska, and Amchitka. In 1745 an enterprising merchant, named Basoff, made a voyage hither in search of the sea-otters. After this period they were more frequently visited, and they daily became better known. The geographical positions of the group we owe principally to the Russian Vice-Admiral Sarytscheff, who accompanied Capt. Billings in his expedition in 1791-2. To Capt. Cook, too, we owe some observations on this island, and some others near it. Captains Golownin and Kotzebue, in the years 1817 and 1818, determined the position of some of their points. Capt. Lütke has given a long article upon this archipelago, from the observations of Lieut. Tébenkoff, M. Ingneström, and several others, which in our general ignorance of this archipelago are valuable. Capt. Beechey has also added slightly to our knowledge of them; and several other navigators, hereafter alluded to, have added something to the general stock. Some of our later sources of information are mentioned in the note on pp. 664-5.

The Aleutian Islands form a chain, which extends nearly E.N.E. from the Isle of Attou, in long. $172^{\circ} 30' E.$, to the peninsula of Aliaska, comprising an extent of 23° of longitude, and lying between 51° and $55^{\circ} 15'$ of N. latitude.

They have been divided into several groups. The western or Blijnie group is composed of four islands—Attou, Agattou, Semitsch, and Bouldyr. Another group is named Kryei or Rat Islands; a third, the Andréanoff Isles; and the eastern group, the Fox Islands, because these animals are only found on the islands composing that particular group.

The prevalence of fogs, and the rapidity and uncertainty of prevailing tides, make an approach to any of the passes between the Aleutian Islands hazardous in the extreme.—*Commander De Long, U.S.N. (Voyage of the Jeannette, vol. i., 1883, pp. 87—88).*

On all these islands traces of volcanic action are evident. On many of them there are volcanos in activity, and some, as for example, Ounimak, are subject to continual volcanic eruptions and shocks. The Fox Islands exceed all others in height; the farther we advance to the West the lower they become. The direction in which almost all the islands of the Fox group lie, lengthwise, is N.E. by N. to S.W. by S. They are low and narrow to the S.W., and increase in breadth and elevation to the N.E. But beyond the Island of Amchitka, where the general direction of the chain runs to the West, this law alters, and the S.E. extremities of the islands are lower and narrower, and their N.W. extremities higher and broader.

The following description commences with the easternmost of the Archipelago, and proceeds westward in succession.

FOX ISLANDS.

This group, extending from Ounimak to Amoukta, is the most important of the Archipelago, commercially, on account of the produce of the chase which is annually drawn from them; and, geographically, from their central situation, and the ports they contain.

OUNIMAK, or *Unimak*, is the easternmost of the group, and is separated from the peninsula of Aliaska by the Strait of Isanotskoy. In a harbour in this strait Krenitzin wintered in 1768. In 1826 Capt. Beechey passed through the strait separating it from the islands to the southward. He calls its South point *Wedge-shaped Cape*, before which lies a rock, and the narrowest part of the strait is formed by the Isle *Kougalga*, Beechey making the distance $9\frac{1}{2}$ miles.

The southernmost point of Ounimak is called *Cape Hitsou*, or *Kithouk*, or *Khitkhoukh*; and, from its shape, by Captain Beechey, *Wedge-shaped Cape*. From this southern cape the coast runs to the N.E. to *Cape Lutke*. The S.W. point of the island is *Cape Sarytscheff*; before it is a large rock similarly situated with respect to it as that of the southern cape.

The island is about 65 miles long in a N.E. by N. $\frac{1}{2}$ N. and S.W. by S. $\frac{1}{2}$ S. direction, and its greatest breadth about 25 miles. It is, so to speak, but the cover to a furnace, continually burning; on the summit of this a high mountain chain extends throughout the island, having several burning spiracles. Notwithstanding the number of craters, the subterranean fire causes frequent earthquakes. The highest of these summits, the *Chichaldinskoi Volcano*, or *Mount Shishaldin*, reaches to a height of 8,685 ft. It is a regular cone; and to the eastward of it is another, with a double summit. It stands nearly in the centre of the island, in about $54^{\circ} 45'$ and $163^{\circ} 59'$. Mr. Whympers says:—"Chichaldinskoi has a very graceful form. Near it is a second mountain of less elevation, with a jagged double summit, of very odd and irregular appearance. Smoke was issuing (September, 1865,) from a large cleft near the summit." At 6 miles from the S.W. side is another equally conical volcano, called *Pogrommoy*, or *Nosovskoi*, which Kotzebue says is 5,525 English feet in height. The *Issannakh Chain* has also two high peaks towards the N.E. extremity of the island. The whole of the mountain chains are nearer the South than the North side.

A broad bed of gravel forms the N.E. extremity of the island, and a low coast extends as far as the village of Chichaldinskoi without any shelter. The village is two-thirds the distance from the N.E. extremity to a cape $3\frac{1}{4}$ miles eastward of Cape Mordvinoff. The N.W. extremity, Cape Mordvinoff (*Cape Noisak*), is in lat. $54^{\circ} 51'$, long. $164^{\circ} 29'$. From *Cape Chichkoff*, which is bluff and very remarkable, because the land on each side of it is very low, to the West extremity of the island, Cape Sarytscheff, the coast forms the base of

the *Pogrommoi Volcano*. The latter cape is bluff, and of a moderate height. At 7 or 8 miles from it, on the summit of the coast, is the village of *Pogrommoi*, off which there is a boat-landing. At 4 or 5 miles E.S.E. of Cape Sarytscheff is the small village of *Nosovskoi*, where there is easy landing, and about 6 miles to the E.S.E. of this is the high steep *Cape Khitkhokh*, with a high pile of stones before it, and which is called *Ounga*.

Rurick or Ounimak Strait, through which Kotzebue passed in 1817, separates Ounimak from the Krenitzin Isles to the southward. Its narrowest part, as before mentioned, is about $9\frac{1}{2}$ miles broad. The currents are very violent in it, being variously stated to run at from 3 to 6 knots.

Although Rurick Strait is the widest and safest for traversing the Aleutian chain from North to South, and *vice versa*, and also the most convenient for passing into the northern part of the Sea of Behring, it is not so advantageous for ships which, coming from the Pacific, are destined for Ounalashka. Capt. Wrangel recommends the Strait of Akoutan, farther westward, for this route.

Krenitzin Islands, the islands next in succession to Ounimak, are five in number. The N.E. of them, called *Kougalga*, in reality consists of two islands, *Ougamok* and *Ouektok*. There is a peak on the N.E. extreme of Ougamok, visible a long way off.

Tigalga, *Kiyalga*, or *Tigalda*, is the next to the S.W., and is about 10 miles long, E.N.E. and W.S.W. Its centre is in lat. $54^{\circ} 5' N.$, long. $165^{\circ} 5' W.$ A small island, connected by a chain of rocks to Tigalda, lies off its northern extremity. Tigalda is mountainous, and intersected by three isthmuses. Birds and sea-animals frequent this island; a great quantity of drift-wood is found on its coast, and coal is found on the shore of Derbinskoi Strait.

Derbinskoi Strait separates Tigalda from Abatanok, and is remarkable among all the others for the extraordinary rapidity of the current and its strong tide races.

Abatanok, or *Avatanak*, lies S.W. by W. of Tigalda, and is about the same size, and lies in the same direction. At 2 miles W. by S. $\frac{3}{4}$ S. of its western point is the small island of *Aektok*, or *Goly* (bare), which is about 3 miles in circumference, and lies 2 miles southward of the South point of Akoun.

Akoun forms the S.W. portion of Rurick Strait, and lies to the West of the Krenitzin Islands. It is about 10 miles long, in a N.N.E. and S.S.W. direction; its breadth is unequal. There are two small bays on it, one in the N.E. part, the other in the N.W. part of the island.

The island is mountainous, and particularly cliffy on its N.E. and North sides. On the South side of the island is a sort of column, which, seen from the East or West, resembles a tower, or steeple surrounded by houses. On its N.W. side is a smoking volcano, and near the village on the side of Akounskoi Strait are some hot springs.

Akounskoi Strait, separating Akoun from Akoutan, is not more than 2 miles

wide, is throughout bestrewed with rocks, and subject to strong currents and tide races.

Akoutan, about a mile W.N.W. of Akoun, is large, mountainous, of a round form, and having a diameter of 12 or 13 miles. It has no good harbour; there are some coves on the northern coast, but they cannot be serviceable to any but very small vessels.

With the exception of Ounalashka, it is higher than the neighbouring islands. Nearly in the centre is an active volcano, 3,898 ft. high. The coasts are steep, particularly on the South side; on the North they slope more gradually and evenly. Volcanic evidences are everywhere abundant, and the fire from the crater was seen in September, 1865. Between its S.W. end and Ounalashka is *Ounalga Island*.

The ISLAND of OUNALASHKA, which is the largest and the best known of the Aleutian Archipelago, follows. It extends about 65 miles from N.E. by N. to S.W. by S., with an average width of 15 miles. The S.W. extreme is in lat. $53^{\circ} 13' N.$, long. $167^{\circ} 47' W.$; and the N.E. part is in lat. $54^{\circ} 1' N.$, long. $166^{\circ} 22' W.$

The name here given as generally known to Europeans is a contraction of *Nagounalaska*. It is the most important of the group, because it was the residence of the chief of this section of the Russian Company's hunting operations. There are about eight villages on the island, together containing about 600 inhabitants.

There are many deep bays on the coasts of Ounalashka, which have nearly all been examined and surveyed by our navigators. The northern shore has the greatest number, as for example:—Captain Bay, the Bay of Otters, Illuluk Bay, Kaleghtha Bay, and Samganooda Bay, visited by Cook.

Unalaska or Captain Bay is formed by *Capes Kalekhta* and *Wessiloffsky*, which lie in an E.N.E. and W.S.W. direction, 9 miles apart, and is about 13 miles to its southern part. The upper part of the bay contains three distinct smaller bays, the eastern, northern, and western bays. Captain Harbour, the southern bay, has not much to recommend it, and its entrance is scarcely more than a quarter of a mile broad.

Cape Kalekhta is a rocky precipitous headland, about 1,500 ft. high, having a peculiar pinnacle rock close off it, named *Priest Rock*. A rocky ledge extends about half a mile outside it. *Cape Cheerful*, the West headland, $8\frac{1}{2}$ miles to W.S.W. of Cape Kalekhta, is high and bold, and is readily recognised from the northward and eastward by a large cascade. The entire eastern shore of the bay, nearly to the village, is studded with sunken rocks. *Constantine Bay* is the first bay southward of Cape Kalekhta, with a reef clear across the entrance. The next bay to the South is *Letum* or *Summer Bay*, with the village of *Imagnée* near its head.

The general direction of the bay is about S.S.W. for 11 miles, and about half-way inside the entrance is divided by a high island, named *Amognak* or

Oumaknagh, rising precipitously to a height of 1,800 ft., forming *Illuluk Harbour* on its East side. The harbour takes its name from the village where the Company had an establishment. Kotzebue says that it would be the best harbour in the universe if the entrance to it were not so difficult; for a vessel entering Port Illuluk, if it should fall calm, would remain exposed to the violent currents and squalls which often occur here. The harbour is $3\frac{1}{2}$ miles in depth, and the soundings in its centre are from 7 to 14 fathoms.

From the N.E. point of Amognak a narrow, low, boulder tongue stretches southward about $1\frac{1}{2}$ mile, forming another fine landlocked harbour, named *Ulakhta Bay*, with 15 to 20 fathoms water throughout. It is known to the Russians as *Dutch Bay*. The holding ground in the centre is good, in 14 to 16 fathoms over black mud and shells. Near the extremity of the boulder tongue, which is in lat. $53^{\circ} 53' 56''$ N., long. $166^{\circ} 28' 34''$ W., is a half-finished house.

To the East of this spit rocky shoals, covered with kelp, extend some distance into the eastern road. Between it and the East shore, which is high and precipitous, is the entrance to Illuluk Harbour, with a depth of 7 to 20 fathoms. This bay is sometimes visited by whalers. The South entrance to the harbour is very narrow and tortuous, and may be considered unfit for navigation. The land around the harbour abounds in grasses, and cattle grow fat. Vegetables also grow well.

It is high water here, on full and change, at $7^h 30^m$; the highest tide observed was $7\frac{1}{2}$ ft.

Igognak Point, on the West side of the entrance to Ounalaska Bay, has some rocks extending in a curve half a mile in the southward, and behind this reef is a safe anchorage. About 2 miles West of the point is a bank of 50 fathoms, noted for its cod.

The prevalent winds in winter are S.E., which bring rain and fog; N.E. winds bring clear weather; and North and N.W., snow. The force of the winds, even in the landlocked harbour of Illuluk, surpasses everything I have ever experienced elsewhere, especially with westerly or south-easterly winds. Shocks of earthquake, and other volcanic phenomena, are of almost daily occurrence.—*Mr. G. Davidson*.

Kaleghta Bay, which lies next to the eastward of Illuluk, is open and deep, and only merits attention on account of a village of the same name which was situated at its head. The *Bay of Otters*, or *Bobrovaia*, adjoins Kaleghta Bay on the East, and is the largest of those which intersect Ounalashka, being 18 miles deep in a N.N.E. and S.S.W. direction. Its breadth, as well at the mouth as the rest of the bay, excepting the North part, is about 4 miles. Both shores of the bay present a large number of small coves, 2 or 3 miles deep, which contain good anchorages; the rivulets which fall from the mountains afford good water. The western part of the Bay of Otters is formed by a

North Pacific.

peninsula, the same land which forms the eastern side of Captain Bay. At the extremity of this peninsula is *Samganooda Bay*, where Cook anchored twice.

Judging from the description given by Cook, this port is preferable to Port Illuluk. It is 4 miles long, and affords safe anchorage throughout its extent; the mouth of the bay is a mile in width, and it narrows toward the bottom to a quarter of a mile, where you may anchor in from 4 to 7 fathoms, on a bottom of sand and mud, being entirely landlocked. This port has also the advantage of being nearer the open ocean. Here there was an establishment of the Russian American Company.

The *Island of Ounalga*, or *Oonella*, lies before Samganooda Bay, as mentioned before. Between it and the Island of Akoutan, to the N.E. of it, is the *Strait of Akoutan*. Capt. Wrangel recommends this strait to be preferred for passing between the islands, because it leads directly to all the ports lying on the N.E. side of Ounalashka. This strait is $2\frac{1}{2}$ miles broad; but it is somewhat narrowed by a chain of islets, *Egg Islets*, lying half a mile off the N.E. part of Ounalga. *Spirkin Island*, which forms the eastern point of the Bay of Otters, is 10 miles long in a N. $\frac{1}{2}$ E. and S. $\frac{1}{2}$ W. direction. *Oudagagh Channel*, which separates it from Ounalashka, is about a mile wide, and $3\frac{1}{2}$ miles long, in a northerly direction. The depth in it is 45 fathoms. At the N.E. end of Spirkin Island lies the small isle *Ougalgan*, being separated by a clear channel about a mile long.

There are two rocks near the coast of Spirkin Island, between which Cook passed in the night of June 26th, 1778. According to Cook the first rock lies 4 miles S. $\frac{1}{2}$ E. from Ougalgan Isle; the other at 5 miles directly to the South of this isle; their distance apart is $1\frac{1}{2}$ league, and the relative bearing N.E. and S.W.

On the eastern side of Ounalashka is the small bay of *Killiliak*, which is easily known by a remarkable cape, named *Amts:hitka*, standing a little to the North of the entrance to the bay. Ounalashka here presents the appearance of being divided into two parts. The bay is perfectly sheltered from all winds, and the depth is about 10 fathoms.

Makouchinskoy Bay lies about the middle of the island, on the western side. It is $2\frac{1}{2}$ miles wide at its opening, and 11 or 12 miles long in an easterly direction. Its head approaches that of the Bay of Otters within 3 miles, and within 7 miles of Captain Bay, in such a manner that this portion of Ounalashka forms a peninsula of 40 miles in circumference, composed of high mountains, among which a very high volcano is to be distinguished.

OUNNAK ISLAND, or *Umnak*, lies next West to Ounalashka, and, next to that island, is the largest of the archipelago. The strait which separates them is 4 miles wide in its southern part; but this is diminished to one-half by *Tinginak Island*, which lies in mid-channel, and renders the passage difficult for large vessels. Outside the strait, at 5 miles to the southward of Tinginak, is a reef, which covers at high water.

Oumnak is 55 miles in length, in a N. by E. $\frac{1}{2}$ E. and S. by W. $\frac{1}{2}$ W. direction. Its height increases from its southern end; and its North end is composed of very high mountains, among which may be distinguished a very high volcano, covered with eternal snow.

Upon the island are two active volcanoes, the first, *Voevidovskoi*, is nearly in the centre of the island, and is its highest point, about 8,000 ft.; the other, *Touliskoi*, is 10 miles from the N.E. side. The S.W. extremity of the island, *Cape Sigak*, lies in lat. $62^{\circ} 50'$, long. $166^{\circ} 42'$. A short distance from this the S.E. coast forms some small open bays, one of which is called the *Old Port*, and is somewhat sheltered from the South from seaward by a bank. Beyond this is *Black Cape*, projecting considerably into the sea, and forming the open cove called *Drovianaia* (wood), on account of the great quantity of drift-wood thrown on to it. Beyond this the coast runs nearly straight, and not very high, to *Voevidovskaia* Cove, open to the South, before which lie the *Voevidovskaia* Islands, mentioned presently. Here the coast is low and sloping, and thus extends to *Gloubokaia* (deep) Cove, into which a river discharges itself, abounding with fish. Farther to the N.E., beyond a mass of rocks 90 ft. in height, inclining to the N.E., is the village *Egorkovskoi*, in a small creek midway between Cape Sigak and Oumnak Strait. The neighbourhood of the village affords great resources. A rude, sandy, and straight coast surrounds this as far as the village *Toul'kakoi*, lying in front of the islet *Tanghinakh*, in the Strait of Oumnak. Near the S.E. coast there are many reefs and banks.

The eastern face of the island facing Ounalashka is steep and rocky in some places, but is not high. The North part is high, sandy, and even, frequently intersected with ravines, but without a single remarkable inlet. The West coast is mountainous, but not steep. On this side, at 8 miles from the S.W. extremity, is the largest village of the island, *Retchechnoi*, standing on a small hill between some lakes inland and the sea-shore. Before it is a small and safe harbour for small vessels. Nearly in the middle of the West side of the island is the large but open bay called *Ingakoadak*.

On the S.E. side of the island, and in front of the *Voevidovskoi* volcano and the bay of the same name, are situated the small islands called, also, *Voevidovskies*. They are six in number, and are 2 miles off the coast, the interval being full of banks.

Oumnak, like the rest of the islands, is deficient of wood, some willow and other bushes only growing on it. It is, next to Ounimak, the most subject to volcanic eruptions. One feature is an evidence of this: it is the abundance of hot springs, one of which resembles the Geysers of Iceland.

To the northward of Oumnak it was stated that a long reef stretched for 26 miles in a nearly North, *true*, direction, at the outer point of which is *Ship Rock*, so named by Cook, in the form of a tower. Mr. Dall, however, could not find this reef.

About half a mile within Ship Rock is the small island of *Joann Bogosloff*,

which is of volcanic origin, and did not appear till 1796, after an earthquake. The length of this small island, from N.W. to S.E., is about three-quarters of a mile. A chain of rocks projects 2 miles beyond its N.W. extremity, and another a mile from its N.E. point. The highest part of the island rises to 844 ft.* This island, as before stated, is said to be connected with Oumnak by a reef of rocks, which doubtless owe their origin to a similar cause; for, in 1778, Cook, and thirty years later Sarytscheff, sailed between Ship Rock and the Island of Oumnak.

To the westward of Oumnak is a group of four—or, according to Lütke, five—volcanic islands, which bear the name of the *Isles of the Four Mountains*; they are all very near to each other. The name of the S.W. isle is *Ouliaga*; of the N.W., *Tano*; the N.E. is called *Tschiganok*; and that to the S.E. *Chagamil*. The first and the last are the largest, being 5 or 6 leagues in circumference. On the U.S. charts the northern island is named *Uliaga*, the middle islands *Kigalgin* and *Kagamil*, and the southern *Chuginadak*, the two latter being the largest.

H.M.S. *Amphitrite*, Captain Charles Frederick, R.N., passed between the Four Mountains Isles and Younaska on June 28, 1853. The four islands are very remarkable, having conical peaks from 3,000 to 4,000 ft. high, and were then covered with snow fully three-fourths of their height. The channel is 10 or 11 miles wide, and apparently free from danger; no soundings at 15 fathoms, a rippling, but not a strong current.

Younaska.—To the S.W. of these islands is Younaska, which is about 15 miles long, N.E. by N. and S.W. by S. There is a high mountain in the centre of the island. *Tschegoula*, or *Tchougoul*, a small island, lies about 8 miles W.S.W. of Younaska, and near the N.E. point of Amoughta. It is of a circular form, and 3 miles in diameter. It seems as if formed of fragments of rock ready to fall down, and has no landing place. At about a mile from it, in the direction of Amoughta, is a small isolated rock.

Amoughta, or *Amoukhtou*, is the westernmost of the chain of the Fox Islands. It is nearly round, and about 6 miles in diameter. Its centre is mountainous, and its summit irregular, the coasts being low, but steep. A

* Admiral Krusenstern adds an account of this phenomenon, from Mr. Baranoff, chief of the American Company's establishment:—"In 1806 a new volcano appeared on one of the Aleutian Islands. They then observed, between Ounalaska and Oumnak, to the North of the latter, a flame jetting out of the sea, and soon after, smoke, which continued ten consecutive days. After this, a white body, of a round form, was observed to rise out of the water, and increase rapidly in size. At the end of a month the flame ceased, but the smoke increased considerably, and the island kept on increasing. In 1814 the island was formed by precipices, covered with small stones, which were being continually ejected from the crater. In 1816, a second expedition found the island very much lower than in the previous year, and its appearance entirely changed. The precipices had fallen, and were continually crumbling away."

short distance from its South end a high column of rock rises above the water.

The Channels between this group are those generally used by ships either going or returning from the Sea of Behring. The Russian Company's vessels generally preferred that of the Strait of Ouninnak; but Capt. Wrangel prefers the Strait of Akoutan, between that island and Akoun, as being much shorter. In returning by this strait, with the prevalent S.W. winds, you may run to the S.E. without being cramped by the coasts.

The Strait of Ounalga should not be used except in case of necessity, on account of its narrowness, its strong currents, and its terrible tide races, which, when the wind and waves oppose each other, are sufficient to dismast a vessel.

The Strait of Akoutan is considered by Lütke the best to quit by. It is 2 miles broad between Akoutan and the five *Tchaitchi* (sea-mew) Islands, which are of an oblong form, distant half a mile from the N.E. point of Ounalga. Care should be taken of these islands in coming from the southward, as a mistake might be fatal.

The tide rips, occurring at half tide, in the approaches to Unalaska Harbour, are only dangerous in severe storms. They are in general met with at the North entrance of Unalga and Akutan Passes, and are especially violent off the N.W. point of Akutan. Unalga Pass is preferable for steamers and small vessels. For large vessels Akutan Pass affords more room. It is a noteworthy fact that there is never any wind over the tide-rips, however fresh it may be blowing around them.—Mr. G. Davidson.

ANDREANOFF ISLANDS.

This group extends from Segouam, or Sigouam, to *Goreli*, or the "Burnt Island," as Lütke also calls the first-named island.

Segouam, or *Goreli*, according to the hunters, is the easternmost of the group. It is intersected by a chain of mountains, divided into three masses, smoke issuing at times from the central mass. In the N.E. part they rise perpendicularly from the water. There are no dangers around it.

Amoughta Channel, to the East of it, is clear, safe, and has similar currents to the rest. The channel to the West, between it and *Amlia*, is far from being as convenient. From the extent of the latter island, and also that of Segouam, a barrier of nearly 100 miles is opposed to the periodic current passing between them, and consequently the water rushes violently from either side through the strait, causing terrible and dangerous races.

Capt. Henry Trollope, R.N., passed in H.M.S. *Rattlesnake*, between Segouam and Amoukta, August 16, 1853, but without seeing land. He confirms this account of the races in the channel. He says, "I never saw such a confused tumbling sea, with appearance of overfalls, &c.; it washed away one of the gangways, and broke on board several times."

Amlia, which succeeds Segouam, to the westward, is long and narrow, and extends nearly East and West, *true*; its length is about 40 miles. The centre of the island is occupied with a chain of mountains, the greater part of a conical form, but, compared with the others, of a moderate height. There is no active volcano on it, and its shores are in general clear. The West cape projects to the north-westward, and is in about lat. $52^{\circ} 6\frac{1}{2}'$. On the South coast, about a mile from the West end, is a large open bay, and an Aleutian village. At this part the island is not more than a verst (two-thirds of an English mile) in breadth, but it is broader in the middle. The South side forms several bays, but all are open save one, *Svetchnikoff Harbour*; this port is 16 miles from the East extremity of the island, and penetrates $1\frac{1}{2}$ mile to the north-westward, and is about half a mile broad. It is sheltered from seaward by a small, narrow island, about three-quarters of a mile in length, North and South, half a mile southward of the East cape of the port; this space is full of rocks, so that, to enter, this island must be rounded to West. Inside there is 14 fathoms water, and farther inside, 6 to $4\frac{1}{2}$ fathoms, sandy bottom. A high rock, lying E. $\frac{1}{4}$ N., $9\frac{1}{2}$ miles from the entrance, and $2\frac{1}{2}$ miles from the nearest coast, will point out the situation of this harbour.

At 5 miles N.N.E. from the East point of Amlia, M. Klotschkoff, an officer of the Russian marine, commanding a small vessel, the *Tschirikoff*, for the American Company, is stated to have discovered a high rock, of 20 fathoms in diameter, on which he found an immense number of sea-calves.

The strait between Amlia and Atkha is not more than $1\frac{1}{2}$ mile broad, is still further narrowed by some rocks, and cannot be passed by a sailing vessel, on account of the furious currents.

ATKHA, or **Atoha**, is the largest and principal of this group. The length of the island, from the S.W. extremity to the farthest point to the N.E., is more than 50 nautic miles. And here we find the same feature, so general in the eastern group, of a narrow and low S.W. extremity, enlarging and increasing in height to the N.E. Like the Peninsula of Makouchin, on Ounalashka, the North part of Atkha also forms a peninsula, crowned with high mountains, the northernmost of which is the active and smoking volcano, called *Korovinskoi*, lying on the North coast, and 4,988 ft. in height. Seen from the N.E., it presents two summits, and on the North is very steep, and the shore inaccessible. At 4 miles to the South rises the volcano of *Klutchevskoi*, and not far from the N.E. extremity is another. The base of the Korovinskoi volcano advances to the North into the sea, forming a rocky escarpment, which is the North extremity of the island. To the East of this cape the coast trends to the S.E. by E. On the other side it runs nearly on the parallel without curvature to the N.W. extremity, called *Cape Potainikoff*, and forms a low, even, flat point, and dropping perpendicularly. It is thus called on account of a reef extending thence 2 miles to the westward. On the cape is a steep, conical volcano. From this the high and cliffy coast runs to the southward, to the low and narrow isthmus

of *Sergheieff*. Its West extremity, Cape Korovinskaia, rises out of the sea in a steep cliff, with many slips.

Korovinskaia Bay, which opens to the West, is formed by the large peninsula and the connecting isthmus. Two coves form the harbour of Korovinskaia, which is perfectly sheltered, but has an extremely difficult entrance between two very low spits of gravel. Mr. Dall found the harbour nearly useless, having silted up, and not more than 12 ft. could be carried over the bar.

The outer bay is $6\frac{1}{2}$ miles broad in its opening. There is only anchorage on the North side, in 14 fathoms, before the entrance to the harbour. It is without danger in the fine season, but in autumn terrible gales, passing from N.W. to N.E., occur, when a ship could not remain here; and at such times the entrance is covered with breakers for several weeks together.

There are two villages upon Atkha. That called *Nikolskoi*, on the South side of the inner harbour of Korovinskaia, consisted of a few houses for the employés of the Russian Company, a church, &c., and is in a low and damp situation, and has many disadvantages. There are about 300 natives on the island. One great inconvenience of Atkha is the extreme scarcity of provisions.

There are two coves on the South side of Korovinskaia Bay. That nearest to the isthmus is only worthy of attention from the fact that fossil wood is found here, which may be an indication of coal. The other cove, *Sarannaia*, is to the S.W. of the former, and is the only place where a ship can anchor conveniently, and also may procure water.

At 6 miles south-westward of Cape Iaitchnoi, and 2 or 3 miles off shore, is the solitary island *Soleny* (salt); it is small, and not high, and between it and the cape is the long *Staritchkoff Reef*. Beyond Cape Iaitchnoi the North coast of Atkha curves to the S.W., and forms several bays, which are open and unimportant. To the eastward of Soleny Island, and to the South of a cape E.N.E. from that island, is the deep bay of *Gloubokaia*, which, it is said, affords excellent shelter. To the S.E. of Soleny Island is a landlocked bay, in which are some excellent harbours.

Cape Tolstoi projects considerably into the sea. On its East side is an open bay; on its West side is *Kovurovskaja Bay*, extending first south-eastward, and then eastward. It is 24 or 25 miles from Korovinskaia Harbour, and, in fine weather, is serviceable, but in bad or foggy weather its entrance is difficult. On the S.W. side of Cape Tolstoi is a conical peak, which rises high and isolated near the coast; and between this and Koniuji Island, at some miles in the offing, are the islets which shelter the bay. Steer for the largest of them, and round it carefully by the lead, and, when once it is doubled, the entrance is not difficult. Near the cape lying near the conical peak, called for this reason *Podsopotchnoi* (under the peak), is a sunken rock, which only breaks at times. To avoid this, pass between the islands.

From this last cape the coast trends 4 miles S.W. by W. $\frac{1}{4}$ W. to *Cape Belchevinskoi*, from which a reef extends for $1\frac{1}{2}$ mile to the north-westward;

and in this direction, at 8 or 9 miles from the coast, is the small island *Koniouge*, which is an enormous rock, perpendicular to the North, and a low point to the S.W. Its surface is constantly changing from volcanic effects, and the Aleutes say that it regularly and slowly keeps rising out of the water: around and on it are an innumerable number of birds.

Beyond Cape Betschevinskoi the coast turns to the South, and forms a shallow bay which penetrates 2 or 3 miles inland, the bottom being separated from the South coast of Atkha by a narrow, marshy isthmus, not more than 300 yards broad. Beyond this the coast trends 2 miles to W.S.W., not far from the mountains, and then turns again to the South, forming two small bays. Beyond this again the coast extends northward and westward, and then forms an obtuse bluff cape; then at a mile farther, another peaked cape; after which the island narrows so as to be not more than one-third of a mile broad, and forms a low, sandy isthmus. To the south-westward of this isthmus a mountain, the last in the island, forms the S.W. extremity of Atkha, distant 37 or 38 miles from the village in a direct line, and about 18 miles from Cape Tolstoi.

It may be said that there is no summer in Atkha; for during those months fogs and rain are particularly prevalent. In winter, on the contrary, the weather is generally clear. The island has abundant evidence everywhere of its volcanic fires.

Kassatotchy Island, which bears W. by N. $\frac{1}{2}$ N., 9 or 10 miles from the mountain on the S.W. extremity of Atkha, is an extinct volcano. It is a mountain rising at once out of the sea, the crater on its summit being stated to be full of water.

Tchastie Islands, a group of small but high islands to the West of Atkha, are thus called (*tchastie*, crowded) from their arrangement. There are thirteen of different sizes, and six large isolated rocks. The island nearest to Atkha is *Oglodak*, $3\frac{1}{2}$ miles distant. It is high, steep, and without landing. These islands are said to be unapproachable, from the strong tide-races and currents which rush between them.

Sitkhin Island, which, to distinguish it from another of the same name to the West, is sometimes called East or Great Sitkhin, is in lat. $52^{\circ} 4'$ or $5'$, and about long. $176^{\circ} 10'$ (centre). It is about 25 miles in circumference, and in its centre is a volcano covered with perpetual snow, which was ascertained by M. Ingheström to be 5,033 English feet in elevation.

Adakh is a large mountainous island, but lower than Sitkhin; it is covered with perpetual snow in some parts. Its North end is in about lat. $52^{\circ} 3'$. The bay on the North side is open, and there are others on the N.E., South, and West sides; that to the South offers the best shelter. It is separated by a small isthmus from the bay on the West coast. About the middle of the N.W. side of the island is the *Bay of Islands*, with good anchorage behind one of the islands. The position and details of the island are very imperfect, as are also those of the next island.

Kanaga, or *Konniaga*, is the island next West to Adakh, to which it is similar in size, being about 28 miles in length, by 5 miles in breadth. The northern part of this island is remarkable by a high smoking volcano, one of the most lofty in the chain; the rest of the island is not very high. Near to its western part is a small island bearing the name of the Isle of Otters. These islands, however, are but incorrectly delineated and placed on the charts.

Tanaga is separated from Kanaga by a channel 2 leagues broad, extending 8 leagues in a north-easterly direction. It is about 27 miles in extent, from E. by N. to W. by S., and of irregular breadth. It is easily distinguished by an elevated volcano, which stands at its S.W. point. Near the point is a bay, which Sarytscheff visited; the entrance may be about 4 miles broad, and it is about 8 miles deep. At this distance, in the North part of the bay, the vessel in which he penetrated anchored on a bottom of fine black sand, in front of the entrance of two rivers. Watering is very easily performed in this bay, the boats ascending the rivers without any obstacles.

About 20 miles S.W. $\frac{1}{2}$ W. of the North point of Tanaga is *Goreloy* or *Burnt Island*, with a circumference of 6 leagues. It has a very high volcano, whose summit is covered with perpetual snow; and M. Ingheström considers this volcano, and those on Kanaga and Tanaga, as the highest in the Aleutian chain. However, later observations do not confirm this.

South of this is a small group, the chief of which are the two small *Délaroff Islands*, which, with those South of it, form the westernmost of the group of the Andréanoffsky Islands. Sarytscheff found the passage between them and the S.W. point of Tanaga quite clear.

At some distance eastward of the eastern islet are two rocks. At about 12 miles southward of Goreloy is a third island, *Kakhvalga*; and a few miles westward of the latter is *Ounalga*, a low island. *Ulak*, also low, and the largest of all, is to the southward of Tanaga.

Amatignak and *Illak* are also two islands to the southward of these again. The southernmost, *Amatignak* ("a chip" in Aleute), is the larger of the two, and the highest of all.

KRYOI OR RAT ISLANDS.

The islands next West of the foregoing are included by Lütke and others under the above denomination.

Semisopochnoi.—About 50 miles West of Goreloy or Burnt Island is the *Isle of the Seven Mountains*. The name (*Semisopochnoi*) is significant of its character. It is of a circular form, and is 10 leagues in circumference.

According to M. Ingheström, its lat. is $51^{\circ} 59'$, and its long. $179^{\circ} 45' 57''$ E. The mountains do not much exceed 3,000 ft. in height. One of the mountains in the North part sends forth smoke. The North and East sides have a wild

North Pacific.

and desolate aspect; on the South and West there are several green spots. The shores are in general clear.

The strait between Semisopochnoi and Goreloy is the best for crossing the Aleutian chain. It is safe throughout, is not less than 45 miles broad, and is not subject to tide races.

Amitchitka is a large island; it is not very hilly, and extends about 10 leagues W.N.W. and E.S.E. Near its West point are two small islands, the larger of which is called *Rat Island*, a name, as above mentioned, which has been extended to the whole group. Behring probably saw this island on October 26th, and gave it the name of St. Marcian (Markiana). He says it was moderately high, and covered with snow.

It is low, and is not more than 4 miles wide at the S.E. part, but is broader and higher in the N.W. Its S.E. extremity forms a peninsula, on which a hillock rises, and from it a reef extends for 2 miles. The South coast runs nearly in a straight line, without any bays or coves. At about a third the length of the island a chain of moderately high mountains rises, and falls again toward the N.W. extremity, where it forms a low but steep cape, called by the Aleutes *Satanna*, or Bird's Cape.

On the North side of the island, at 10 miles from its East end, is *Kirilovskaia Bay*, which was stated to be the only place in the island where you can stay at anchor. This anchorage is somewhat sheltered from seaward by a reef off its middle, which requires caution in entering; there are also some reefs on either side of it. It is dangerous to remain here in autumn or winter, when northerly gales are prevalent. The lat. of the bay is $51^{\circ} 27' 1''$, long. $179^{\circ} 20'$ E. High water occurs about 10 o'clock, at full and change.

However, when it was visited by Mr. Dall, in 1873, he found nowhere more than 3 fathoms of water, and only the smallest class of vessels could enter it. The schooner *Yukon* anchored in *Constantine Harbour*, on the North side of the S.E. end of the island.

To the N.W. of Amitchitka are the *Tschegoula Isles*, a group of four small hilly islands, which extend about 6 leagues. One of these is called by Lütke *Little* or *West Sitkhin*, another is named *Davydoff*.

Kryoi, *Rat*, or *Ayougadagh Island*, which gives its name to the group, is 7 miles long, mountainous, and in lat. $51^{\circ} 45'$, long. $178^{\circ} 10'$ E.

Kiska, a hilly island, with the exception of its eastern part, which is low, lies to the W. by N. of the preceding. Its length, N.E. by E. and S.W. by W., is 25 miles. A rock, in the form of a column, lies 3 miles N.W. of the island. Behring saw the island October 28, 1741, and he named it St. Stephan. According to M. Inghoström, there exists to the East of Kiska, at $1\frac{1}{2}$ mile distant, a small isle, which he called *Little Kiska*; and 3 miles from this, in the same direction, the small island *Tannadagh*, and a rock. He also mentions some rocks, which do not uncover, between the islands Bouldyr and Kiska, at the distance of 5 leagues from the former. Capt. Lütke, however, considers this

position as doubtful. Some other detached rocks are stated to lie in the channel eastward of the island. Capt. Hague, S.S. *Dora*, 1884, reports that he observed a reef with kelp on it, over which the sea broke, about 5 miles eastward of the N.E. point of Kiska.

The harbour of Kiska is a noble bay, perfectly protected from all winds, with good holding ground and a moderate depth of water. The entrance is wide enough to enable a sailing vessel to beat in or out at any time. There are no hidden dangers, and the depth of water is sufficient for any vessel.—*Mr. W. H. Dall.*

Bouldyr lies to the W.N.W. of Kiska. It is a hilly island, surrounded by peaked rocks, which extend to half a league beyond the S.W. point of the island. It is about 4 leagues in circumference, and two large rocks exist at the western part of the island.

BLIJNI GROUP.

This group, composed of two islands and a collection of separate rocks, is called *Blijni*, or Near Islands, because it is the nearest to Kamchatka, of the Aleutian chain. The discovery belongs to Behring.

Semitsch forms a portion of this westernmost group of the Aleutian Islands. It consists of two small islands half a league apart, and extending E. by S. and W. by N., 6 or 7 miles, with some rocks beyond the East end. On the charts of Sarytscheff and the Russian Admiralty a group of rocks, named *Ingestern*, was inserted, as lying 16 leagues to the E. by S. of the Isle of Attou. Their distance from the S.E. extremity of the Semitsch group is estimated at 10 miles in an E. by S. $\frac{1}{4}$ S. direction, but their position is very doubtful.

Agattou, to the S.W. $\frac{1}{4}$ S. of the Semitsch Islands, according to Sarytscheff, has a circumference of 34 miles. It is separated from Attou by a strait of 15 or 20 miles wide.

ATTOU is one of the largest of the Aleutian Islands, and has about 220 inhabitants. Its eastern extreme lies 18 miles W. by N. from the Semitsch Islands. According to Capt. Golownin's observations, in 1808, it is $27\frac{1}{2}$ miles in length, East and West; but Admiral Sarytscheff makes it 48 miles long. In the S.E. part of the island is a bay called *Massacre Bay*. It is about 3 miles wide, and midway between the two outer capes is a group of small islets and rocks, within which there also appears to be a low reef, and another lies outside them, half a mile to the S.W. Lieutenant Etolin discovered on the North coast of Attou an excellent bay, which he called *Tschitschagoff Bay*, where the Russian-American Company had an establishment. It is in lat. $52^{\circ} 56'$, and 9 miles from the eastern point of the island.

This is the western extremity of the Aleutian chain, which forms the southeastern limit of the Sea of Behring. The two islands lying near the coast of Kamchatka, Copper and Behring Islands, 180 miles to the N.W., might almost

be considered as a continuation of the chain, but, as they are more connected with the western coast, they are described hereafter in connection with it.

Attou is the westernmost of the islands ceded by Russia to the United States, being so mentioned in the treaty. The territorial division passes midway between it and Copper Island, and then in a straight line to the middle of Behring Strait.

BEHRING SEA.

The extensive landlocked sea which bears the name of its great discoverer has been alluded to in the introduction to this chapter. Although very remote from ordinary commerce, its eastern part has been frequently traversed by navigators competent to describe its features. Of these, Admirals Beechey, Kellett, Collinson, Captains Moore, Trollope, and others, may be cited as having aided in composing the chart. The one great physical feature is the extensive bank of soundings which stretches off for 25 to 350 miles from the American coast, affording an immense anchoring ground for the whaling fleet which frequents its waters. The eastern side, with which we are less acquainted, is deeper, causing a great difference in the mode of whale-fishing; to the eastward, the animal plunging into the mud in shoal water; to the westward, diving to great depths.

The whale-fishery has been mentioned in the introductory remarks to this chapter. But, in addition to their primary pursuit, the whalers were all more or less traders, and by their traffic with the natives of the more distant ports and places, so far interfered with the exclusive privileges of the Russian-American Company, that the question was made one of justice to the Russians, that the United States should extinguish this privilege by the payment of a sum of purchase money.

The shallowness of the northern part of the sea, and of Behring Strait, has a marked effect on its physical condition. It will not allow of any floating icebergs drifting southwards from the Arctic Sea; the current generally sets northward, so that its climate, though severe, is not so inclement as a region in a corresponding latitude on the opposite side of the American continent. In consequence of the comparative shallowness of the water, a strong wind will raise a very ugly sea in a short time.

The seasons of navigation upon the two shores of Behring Sea are usually somewhat uneven, the ice remaining longer in spring upon the Alaskan coast than it does on the Siberian shore; and the reverse in autumn, when the ice from the Arctic forces its way through Behring Strait, and fills the western portion of this sea for some distance before ice commences to form on the East coast.—*Cruise of the "Corwin."*

The American side all belongs now to the United States, as before mentioned, being included in the Alaska territory. And our task is rendered some-

what difficult on account of the change of masters, which may induce other changes of which we have received no account.

The **PENINSULA of ALIASKA**,* whose south-eastern coast has been previously described, forms, with the Aleutian Archipelago, the southern limits of Behring Sea, or, as it has been sometimes called, the Sea of Kamchatka. The description is therefore resumed at the point where the former left off, namely, at the Strait of Isanotskoy. The charts are imperfect.

Point Krenitzin appears to be the first prominent point to the north-eastward. It is the extremity of a low bed of gravel, and is the N.W. point of an open bay, on the East side of which is the village *Morjovskoi* (Morses), standing on low, marshy land, intersected with numerous lakes.

Izenbek is the next port in proceeding north-eastward. Its S.W. point, *Cape Glazenap*, or *Mitkoff*, is in lat. $55^{\circ} 14' 8''$, long. $162^{\circ} 50' 7''$ W. This cape is very remarkable by a considerable elevation, and by its form; at a distance it is like an island separated from the low land to the South of it. The mouth of the bay is filled up by a long and very low island, divided into two or three at high water. Its South point is about a mile distant from Cape Glazenap, and its North point above 2 miles from Cape Moffet. The depth in the South entrance was found to be $4\frac{1}{2}$ and 5 fathoms, bottom of fine black sand. It was considered that *Izenbek Bay* would offer anchorage.

Amak or *Aamak Island*, lying off this part of the coast, is an extinct volcano, about 2,000 ft. high, covered with calcined stones and lava. It is rather less than 4 miles in length, in a N.W. and S.E. direction, and the position of its South extremity is lat. $55^{\circ} 25'$, long. $163^{\circ} 1' 30''$. At 2 miles N.W. from its North end is a rock called *Sivoutchy* (or Sea-lions) *Rock*. Between the island and the main the depth is from 9 to 14 fathoms. Shoals are stated to extend W.N.W. and S.S.E. of it.

The coast to the north-eastward presents nothing very remarkable: it trends first N. by E. $\frac{1}{2}$ E., and then N.E. $\frac{1}{2}$ N. For a distance of 50 miles there are only two capes, *Leontovitch* and *Leskoff*, somewhat higher than the rest. In this space there is much drift-wood. Cape *Leontovitch* is low, but is the most conspicuous, as beyond it the coast trends more to the East.

Cape Rojnoff or *Roshnoff*, which is at the extremity of the extent of coast above alluded to, is very low; and at $1\frac{1}{2}$ mile from it is the western point of *Kritskoi Island*, also very low; the two form the entrance to a shallow bay, which runs in to a low isthmus, about 3 miles in breadth, separating it from *Pavlovskai Bay*, on the South coast of Aliaska. The chain of mountains which extends through the peninsula is interrupted in this part. The rise of the tide is 15 ft., and the (approximate) time of high water is $7^h 30^m$.

* Captain Lütke says, that in spelling this *Aliaska* he follows the orthography generally adopted in the colonies. It was sometimes previously spelt *Aliaksa*. The natives pronounce it *Aliakshka*; so that both modes are right or wrong.

MOLLER BAY is a large indentation of the land, which narrows the peninsula to 12 miles in breadth at this part. A large portion of this bay is filled with shoals, which uncover at low water; but in its S.E. angle is a small cove, where there is sufficient water for every description of vessels. This is the only port which exists on all the North coast of Alaska. It is about a mile in length and breadth, with from $4\frac{1}{2}$ to 8 fathoms, muddy bottom. In entering it you must range close to the bed of gravel covering the cove from seaward, to avoid a shoal which is less than a mile from it; and as soon as you have made out this bed of gravel, steer for a point on the East side of the port, which is particularly remarkable by its blackish colour, and which lies about $1\frac{1}{2}$ mile N.E. by E. from the extremity of the gravel bed. The mountains, which are of a moderate height, advance here to the coast, leaving no room for the mossy plains which generally occupy the space between the foot of the mountains and the sea-shore.

The bay is about 6 miles wide in its opening. Its entrance on the West side is formed by the East point of *Kritskoi Island*, which was determined to be in lat. $56^{\circ} 0' 7''$, long. $160^{\circ} 41' W$. The extremity of the bed of gravel which forms the port is $7\frac{1}{2}$ miles to the S.E. by E. from this. *Kritskoi Island* is very low, and extends 9 miles along the coast in an E. by N. and W. by S. direction. Opposite its West end is *Cape Rojnoff*, before mentioned.

From Moller Bay the coast trends to the N. by E. $\frac{1}{2}$ E., and at 20 miles distant is *Cape Koutouzoff*. This cape is high and abrupt, and 13 miles N. by E. $\frac{1}{2}$ E. from it is *Cape Seniavine*, also high and steep, the space between being low, except two hillocks on the coast, about midway between. *Cape Seniavine* is in lat. $56^{\circ} 23' 45''$, long. $160^{\circ} 2' 45'' W$.

The coast beyond this offers nothing remarkable for a considerable distance, and consists of a low, level, mossy plain. At about 9 leagues from *Cape Seniavine* a low bed of gravel commences, which extends in front of the coast for 10 miles. Beyond this the low level coast extends 10 miles farther to *Cape Strogonoff*, which is extremely low, and projects 2 miles to the North.

Comte Heiden Bay (or *Houdobin Bay*) is formed by the low *Cape Strogonoff* to the westward. Before this cape is an islet, equally low, called on the chart *Chestakoff Islet*, and between this islet, or rather between the shoal off its North end, and the coast of the continent, is the entrance of the bay, which extends 6 miles to the S.E., and the opening is $2\frac{1}{2}$ miles broad.

From this the coast, equally low, uniform, and covered with moss, trends to the N. by E. In lat. $57^{\circ} 5'$ are two moderately high capes, terminating to seaward in sandy downs.

Cape Menchikoff (named after the Prince) is in lat. $57^{\circ} 30' 4''$, long. $157^{\circ} 58' 5''$, and consists of a mound of sand, with marshy land surrounding it on all sides. At 8 miles N. by E. from this is the mouth of the *River Ougatchik*, or *Soulima*, which is 2 miles broad, and has a depth in its entrance of from 10 to 18 ft. at low water. The North point of its mouth, named *Cape Greig* after

the Admiral, is high and steep; it is in lat. $57^{\circ} 43'$, long. $157^{\circ} 47' 2''$, and is surrounded by sand-banks, dry at low water. From this the coast trends, low, level, and straight, in a general N. $\frac{1}{2}$ W. direction to the mouth of the Agougak River.

The River Agougak, or *Ugagouk*, Krusenstern considers to be the northern limit of the Peninsula of Alaska, as it really separates Alaska from the continent of America. It rises in a lake called *Nanouantoughat*, which is only separated from the Strait of Chelighoff by a neck of land 5 miles in breadth, at the back of the Bay of Poulao. Over this space was a portage for the merchandise collected by the Russian-American Fur Company at the establishments in Bristol Bay, which was thus transported, by means of the river, to the head-quarters at Sitka.

The breadth of the river is about 2 miles at its mouth, and at about 7 miles N.E. from it is a hill, which, with Cape Tschitchagoff, serves to point out the position of the entrance. Its shores are very low, particularly the South side. The current is very rapid, the tide rising 20 ft.

Cape Tschitchagoff, on the North side, is bluff without being high, and surrounded for 2 miles distant by shoals dry at low water.

From this cape a level marshy coast succeeds. Its aspect is most extraordinarily monotonous, and for 30 miles in a North direction there is only one spot, in about lat. $58^{\circ} 35'$, where there is a hill, which rises about 200 yards from the sea, forming an elevation like a wall composed of sand and clay. *Cape Souvoroff*, which is at the distance above named, forms the North point of the mouth of the *River Nanek* or *Naknek*. This river, flowing from a lake of the same name, traverses the Peninsula of Alaska. At its mouth it is about two-thirds of a mile in breadth, and there is 2 fathoms water in it. On each side of the mouth are villages; that to the right is *Koutchougoumut*, that to the left *Paougvigumut*. The position of the latter, which was a Russian establishment, named *Souvoroff*, was ascertained to be in lat. $58^{\circ} 42' 5''$ N., long. $157^{\circ} 0' 30''$ W. The River Nanek abounds with an extraordinary quantity of fish. From the evidences seen on its borders, the tide rises in the river to 30 ft.

BRISTOL BAY.—The coast we have been describing forms the southern portion of the coast of this bay, which was named by Captain Cook after the Admiral, the Earl of Bristol. This great indentation was sailed around by Capt. Cook, but the shoals which obstruct it prevented his making a detailed examination of its shores. Lieut. Chramtschenko, an officer of merit, who accompanied Kotzebue in the *Rurick*, was sent in 1821 to examine it in detail, and subsequently to 1821, he, together with M. Etoline, a naval officer in the Russian-American Company's service, were annually despatched, in two vessels, to explore the American coasts. To these officers we owe the more accurate knowledge of all the coast from Cape Newenham to Norton Sound, which Capt. Cook could not approach on account of the shoal water.

Cape Newenham forms the northern point of this bay, and Cape Ounimak, the western point of the Island of that name off Alaska, may be taken as its southern limit; the latter lies 270 miles South of Cape Newenham, so that the N.W. coast of Alaska forms the southern part of Bristol Bay.

This bay contains another inner bay, which is formed by a promontory, named *Cape Constantine*, and within which three rivers debouch. The northernmost of these is the *Bristol River*. The Ouglaghmoutes (as the natives of the bay are called) give it the name of *Quitskak*, or *Kvichak*. The Ougaguk, on the opposite side, has been before described.

The third river which enters this inner bay, to the westward of the Bristol River, is called *Nouchagak*, or *Noushagak*, its course being in a northerly direction. The opening formed on the North by the coast, and by Cape Constantine on the South, may be taken as its mouth, which is 20 miles broad, and preserves this breadth to the distance of 30 miles; it then turns rather more to the eastward, and its breadth begins to diminish. In lat. $58^{\circ} 57'$ the river is still 3 miles broad, and it is here, on the left bank, that the Russian Company founded an establishment, called *Fort Alexandroffsk* or *Alexandra*. A bank, 15 miles in length, lies before this establishment; and it is between this bank and the main land that there is a passage to the road of Alexandroffsk. The tides are very strong in the river; they rise 23 ft. in the summer months, and 47 ft. in the autumn. The ebb tide runs from 4 to 5 miles an hour.

The extremity of Cape Constantine is in lat. $58^{\circ} 29' N.$, long. $158^{\circ} 45' W.$ It is surrounded by sand-banks to the distance of 4 leagues to the southward. In general, all the coast between the mouths of the Nouchagak and Bristol Rivers is bounded by similar sand-banks. The eastern point of the bay, forming the entrance of the Nouchagak, is named *Cape Etoline*, the bank extending off which narrows the entrance of the river to 7 miles in breadth. The bay itself is called *Khrantschenko Bay*, after the Russian surveyor.

From Cape Constantine the coast takes a westerly direction, and forms, with Cape Newenham, an extensive bay of 105 miles in extent, into which the two rivers, *Kululak* and *Tujugiak*, discharge themselves. There are several islands in this bay; Cook only saw the easternmost, which he named *Round Island*, and this is an elevated hill, about 7 miles from the coast. At the distance of 20 miles to the westward of Round Island is a larger one, about 50 miles in circumference, which has been named *Hagemeister Island*, after the captain of that name, who was for some time commander of the Russian Company's colonies here. Between *Calm Point*, its southern point, and Round Island, there are four other islands in a north-easterly direction. Lieut. Khrantschenko passed between these islands, and between the main land and Hagemeister Island. This channel is about 8 miles in length, and it may be passed through either from the North or South; the anchorage in it is safe throughout. About 24 miles W.S.W. of Calm Point is *Cape Peirce*, behind which, according to Khrantschenko, there is a small bay which affords anchorage.

CAPE NEWENHAM, 15 miles to the W. $\frac{1}{2}$ S. of this bay, was seen by Captain Cook, July 16th, 1778, and was so named by his lieutenant, Mr. Williamson, who landed here. It is a rocky point of tolerable height, situated in lat. $58^{\circ} 42'$, long. $162^{\circ} 5'$. Over, or within it, are two elevated hills, rising one behind the other, the innermost, or easternmost, being the higher. The country produces neither tree nor shrub, and the hills are naked.

Off the westernmost point of the cape there is a small island, according to the Russian charts, named *Sea Lions' Island*. From Cape Newenham the coast trends to the northward, and here commence the sand-banks and shoals lying before the mouth of the great river *Kuskowime*, or *Kouskoquim*, which discharges itself into the sea in lat. $59^{\circ} 50'$, and which was explored by Lieuts. Khramtschenko and Etoline. There are many villages on its banks. Off the entrance, and about midway between Capes Newenham and Avinoff, a 9-feet shoal is marked on the chart.

About 18 miles N.E. by N. of Cape Newenham is *Tehagvan Bay*, $4\frac{1}{2}$ miles long, and 3 miles broad. It is 2 cables wide at the entrance, the sides of which are lined with shoals.

The *Bay of Good News*, 16 miles N.W. $\frac{1}{2}$ N. from Tehagvan Bay, was reached by the land expedition of Oustugoff and Korsakoff in 1818—19. If it received its name from the reports gathered of some white-bearded men on the banks of the Kvikhpak River, it would be more properly called the Bay of False Alarms. It was examined in 1821 by M. Etoline. From his observations, the extremity of the gravel bed, which bounds the opening of the bay to the North, is in lat. $59^{\circ} 3' 9''$, long. $161^{\circ} 53'$, 24 miles North of Cape Newenham. It penetrates $8\frac{1}{2}$ miles in a N.N.E. direction, and is $5\frac{1}{2}$ miles broad, but its entrance is narrowed by beds of gravel to a width of half a mile. Its shores are surrounded with shoals, so that there is only good anchorage in the middle, and that not too far in. In entering, keep on the North side. It is high water, on full and change, at about $6^h 15^m$; the greatest rise being 13 to 16 ft.

Capt. Cook endeavoured to proceed northward along this coast, and penetrated to lat. $59^{\circ} 37\frac{1}{2}'$, but was prevented from getting farther from the shallowness and intricacy of the channel. He then attempted to proceed to the westward, but it was not until he had returned nearly to the parallel of Cape Newenham, by the same route, that he could get to the West, clear of the banks of sand and stones which confine it.

Under a line drawn from the North point of Goodnews Bay to Cape Avinoff, the greatest depth between the shoals is 8 fathoms. In lat. $59^{\circ} 48'$ is the bar with only 2 fathoms, and a little lower down the channel is divided by a sand-bar which has 6 fathoms in the narrow channel to the East, and only two in the broader western one.—*Mr. W. H. Dall*.

NUNIWACK ISLAND,* discovered by Captain Wassilieff in 1821, lies

* *Nuniwack*, or, as it is otherwise spelt, *Nounivak*, or *Nounivok* (Lütke), was so named *North Pacific*.

W. by N., 130 miles distant from Cape Newenham. It is about 55 miles in extent E. by N. and W. by S., and about half that in breadth. *Cape Etoline*, its N.E. extremity, is in lat. $60^{\circ} 27' N.$, long. $166^{\circ} 10' W.$, and its S.E. point is in lat. $60^{\circ} N.$, long. $165^{\circ} 22' W.$ A channel, 25 miles in breadth, separates it from the continent, which here forms a large cape in lat. $60^{\circ} 35' N.$, long. $165^{\circ} 20' W.$, discovered by M. Etoline, to which he gave the name of *Cape Vancouver*, and that of Cook to the strait, now named *Etoline*. The average depth in the strait is 5 to 8 fathoms, deeper toward the island.

Cape Etoline lies about 25 miles S.W. of Cape Vancouver, and has a sunken rock off it. The West extreme, which forms a moderately high, steep cape, is in lat. $60^{\circ} 10'$. From this the N.W. coast trends N.E., and the S.W. coast to E. by S. $\frac{1}{4}$ S. In approaching it from the West, the island presents a level coast, not high, and terminating to seaward in reddish cliffs. There are several places where anchorage may be found; but the best place is in the strait on the continental side, where the depth is 6 to 8 fathoms, gravel bottom. Several villages were seen on the island.

The *Corwin* found good anchorage, with shelter from a S.W. gale, on its North side, about 20 miles from the West end, off a small native settlement. The natives were very shy.

Cape Avinoff, the S.E. limit of Etoline Strait, is in lat. $59^{\circ} 40'$. It is not high, but at a distance resembles an island. It is surrounded by shoals to the distance of 7 or 8 miles, so that it cannot be approached even in a boat within this distance. This bank lines the coast as far as Cape Vancouver itself. On the North side of Cape Vancouver is a wide and shallow indentation of the coast, named *Etoline* or *Hazen Bay*.

CAPE ROMANZOFF, or *Roumiantsoff*, was thus named after the great statesman by MM. Khramtschenko and Etoline, although Capt. Schischmareff had already seen it two months previously, that is, in June, 1821. It forms the western extremity of the vast and marshy delta of the Yukon River. M. Etoline determined its lat. as $61^{\circ} 53'$; M. Khramtschenko as $61^{\circ} 50' 5''$; and its long. is about $166^{\circ} 13'$. It is thus about 80 miles N.W. $\frac{1}{4}$ N. from Cape Vancouver. It is high and bluff, and in the middle of August was still partly covered with snow, which well distinguishes it from the low and sandy shores to the North and South of it. It is entirely free from wood, like the adjacent coasts. When seen from a great distance, it shows like islands.

Between this cape and Stuart Island, to the N.N.E., the coast is low and marshy, with here and there capes and small hills, and intersected by the mouths of the River Yukon. The sandy shoals which line this space, according to what the inhabitants say, do not reach to the coast itself, but leave be-

by the Company's officers, Etoline and Khramtschenko, who, simultaneously with Wassilieff, discovered it in 1821, after the native appellation. The latter called it, from his ship, *Discovery Island*, but the first name is far the best.

tween a channel deep enough for ships; it is only off the river mouths that it is broken by other banks, between which are the passes. Outside this extensive shoal two patches of $4\frac{1}{2}$ fathoms have been reported, one about 40 miles W. $\frac{3}{4}$ S. from the West end of Stuart Island, and the other 25 miles farther to S. by W. $\frac{3}{4}$ W.

The **YUKON RIVER** is one of the largest of North-West America; yet our knowledge of its existence dates from very recent times. Its character was first made known to Europe by the Expedition in 1850—1, and one of Captain (afterwards Admiral) Collinson's officers, Lieut. Barnard, was killed at Nulato by the natives, in ascending it. But the officers of the Russian-American Company first ascended it in 1835. Derabin went from Norton Sound to the river in 1839, and in 1842 commenced the Fort at Nulato, which long bore his name. It was visited in the same year by Lieut. Zagoskin, I.R.N., who made many observations here.

The Yukon or Kwich-pak (pronounced Kwif-pak, both words signifying "big river"), is an immense stream. At Nulato, 600 miles above its mouth, but only 50 miles from the head of Norton Sound, the river is from $1\frac{1}{2}$ to 4 or 5 miles wide, and it has been ascended, still as a large stream, for 1,800 miles. Its tributaries would be large streams in Europe. But all this magnificence of nature seems doomed to be almost useless to man.

At one period it was of the greatest interest to civilization. It was selected by the Western Union Telegraph Company as the route by which the telegraph wires were to connect the New and the Old World; and, as before stated, this gigantic enterprise had far advanced, when, in 1867, the success of the Atlantic cable led to its sudden abandonment, an event which caused so much sorrow in those employed on it, that they hung black cloth on the telegraph poles at Unalacheet, in Norton Sound, and put them into mourning.

Mr. Frederick Whymper's admirable work on his travels in Alaska, and on the Yukon, will give many most interesting particulars of this enterprise and of the river.*

The Yukon enters Norton Sound by many mouths, forming an extensive delta. The turbid waters have so filled up the head of the sound, that it is very shallow, and the water is fresh 10 miles out to sea.

The various entrances were examined by Capt. E. Everett Smith, attached to the telegraph party, and he found that the southern mouth, the *Koosilrav*, gave from $2\frac{1}{2}$ to 9 fathoms, but the entrance to it is far out. The intermediate mouths to the North are too shallow, and the *Aphoon Mouth*, opening into the

* See, also, a Paper by the same author in the *Journal of the Royal Geographical Society*, vol. xxxviii., 1868, pp. 219—236; "Alaska and its Resources," by Mr. W. H. Dall; and an interesting Paper by Mr. E. W. Nelson, U. S. Signal Service, "A Sledge Journey in the Delta of the Yukon," published in the *Proceedings of the Royal Geographical Society*, November, 1882, pp. 660—670, with a Map.

Kwikhpak mouth of the river, is the only available one, and has a depth of 3 fathoms. The mouth of the Kwikhpak is in about lat. $62^{\circ} 40'$, long. $163^{\circ} 55'$. The Aphoon, or Upphoon, is also entered by a channel from Pastolik Bay. These mouths are generally blocked with ice till June 1st. At the latter mouth is *Pastolik*, a village famous for the manufacture of skin boats.

The coast trends to the N.N.W. beyond Pastolik, past *Cape Romanoff*, a solitary rounded hill, towards Stuart and St. Michael Islands, southward of which it turns to N.E. by E. $\frac{1}{2}$ E.

Stuart Island, in lat. $63^{\circ} 35'$, is 6 or 7 leagues in circuit. Some parts of it are of a moderate height; but in general it is low, with some rocks lying off the western part. One might anchor in 5 fathoms between the N.E. side of this island and the continent, but wholly exposed to northerly winds. Also in the North entrance to the channel between the islands, where 3 fathoms may be obtained. The coast of the continent is for the most part low land, but high land is seen up the country. It forms a point opposite the island, which was named by Cook *Cape Stephens*, and lies in lat. $63^{\circ} 33'$, long. $162^{\circ} 19'$; this is the North extremity of St. Michael Island.

Some drift-wood was seen upon the shores both of the island and of the continent, but not a tree was perceived growing upon either. The inhabitants of Norton Sound are entirely dependent on this drift-wood, brought down by the great River Yukon, and which is found on almost every part of its shores.

St. Michael Island, to the eastward of Stuart Island, is 63 miles N. by E. $\frac{1}{2}$ E. from the Kwikhpak mouth. It can scarcely be called an island, as it is separated from the main only by an insignificant canal, the bar at its eastern entrance having only 5 ft. over it at spring tides.

Chaktolimout Bay, called by Cook *Chacktoole*, is an open bay to the northward of St. Michael Island, between Capes Denbigh and Stephens. It is surrounded by a low shore, where the water is so shoal that there is no passage for ships between Besborough Island and the main, though it is 6 or 7 miles off it. Capt. Cook anchored in the bay, but he stated that it is but an indifferent anchorage. There was very little rise of tide.

Tebenkoff Cove, on the East end of St. Michael Island, was discovered in 1831 by Lieut. Tébenkoff, an energetic employé of the Russian Company. It penetrates $1\frac{1}{2}$ mile to the S.S.W., and is closed on the South by a small low island, on each side of which is a strait. The bay is not more than a mile broad, and at its West extremity are two islets, very close to the coast. As far as the middle of the bay there is 21 to 24 ft. of water. The anchorage under the West side, opposite the village, is only exposed to N.N.W. and N.E.; but even with these winds there is no heavy sea.

REDOUBT ST. MICHAEL (formerly *Fort Michaelovski*) is situated in Tébenkoff Cove, southward of the villages, and was founded by Lieut. Tébenkoff in 1833. H.M.S. *Herald* came here in September, 1843, and Dr. Seeman thus describes the place. The Fort of St. Michael, or Michaelovskoi, then belonged

to the Russian-American Fur Company, and supplied two other trading posts, situated some distance in the interior. It is now a trading station of the Alaska Commercial Company, and stands on a little tongue of land, in lat. $63^{\circ} 28\frac{1}{2}'$, long. about $162^{\circ} 3' W.$ It is built in the form of a square, composed of trunks of trees, which are laid horizontally over each other, in the manner of the American block-houses. At each angle is a watch-tower, with loop-holes; within the walls are the various store and dwelling houses; close by, a chapel, consecrated to the rites of the Greek Church; and at a short distance a windmill for grinding corn. Grain is imported by way of Sitka, St. Michael itself not producing it, nor indeed any cultivated vegetables, except a few turnips. About four hundred yards from the fort is an Esquimaux village, the inhabitants of which are a much finer-looking race than the more northern tribes. The country adjacent is, like the greater part of the Arctic regions, a vast moorland.

Mr. Frederick Whympers came here with the telegraph party in 1865, and he says that the station is built on the model of a Hudson Bay Company's Fort, with enclosure of pickets, and with bastions flanking it. Inside are the store-houses and dwellings of the employés, including the "casine" (*caserne*), or general barrack, bath, and cook-houses. These painted yellow, and surmounted by red roofs, gave it rather a gay appearance. The inhabitants of the fort—all servants of the Company—were a very mixed crowd.

The entrance into the cove is not at all difficult. After reaching Stuart Island you can run parallel with the coast at the distance of a mile in not less than 4 fathoms water; then you can range very close to the two islets on the West side of the cove. Coming from the North you must make either Besborough or Egg Islands; the first lies to the North of the cove, and the second at 12 miles to the N.E. *Egg Island* is smaller and lower than Besborough, and about it there is anchorage in $3\frac{1}{2}$ fathoms.

Two and a half fathoms may be carried well up into the cove, until opposite the boat-house. This is the best place for small vessels. The rise of tide will not average over 4 ft., and depends much upon the wind. Fresh fish, game, or deer meat, can usually be obtained here by vessels. Good water can be procured on the shore of the mainland, in a small rocky cove opposite the Redoubt.

—Mr. W. H. Dall.

Unalachleet, or *Unalaklik*, about 40 miles N.E. by N. $\frac{1}{4}$ N. from Redoubt St. Michael, is at the mouth of a small river of the same name, and was a Russian post founded in 1840. According to Lieut. Zagoskin, it is in lat. $63^{\circ} 53' 33'' N.$, long. $160^{\circ} 30' 16''$; later observations place it about 13 miles farther westward. Mr. Whympers states that it resembles St. Michael in being enclosed by a picket, but is otherwise on a much smaller and poorer scale. To the N.W. of the post was a large village of Malemute and Korink Indians, a race of tall and stout people, but in other respects much resembling the Esquimaux. Extensive shoals prevail off the mouth of the river.

The main stream of the Yukon is not more than 35 miles distant from this part of the coast, and there is a portage between it and Unalaklik.

Besborough Island was seen at 15 leagues off by Cook, and though it lies 6 or 7 miles from the continent, has no channel inside it for ships, on account of the shallowness of the water. It is stated that there is anchorage in 4 fathoms inside it.

From the mouth of the Yukon River northward to Behring Strait the coast is broken occasionally by rugged cliffs, but as a rule is low and undulating; along the beach are strewn great quantities of drift-wood.—*Cruise of the "Corwin."*

Cape Denbigh is about 50 miles N. $\frac{1}{2}$ E. from the North end of Stuart Island, and 8 miles W. by N. $\frac{1}{2}$ N. from Besborough Island. It is the extremity of a peninsula, united to the continent by a low neck of land, on each side of which the coast forms a bay, that to the southward being Chaktolmout Bay, just mentioned.

The whole of the beach around the bay seemed to be covered with drift-wood; but on account of the shoals, which extend quite around, to the distance of 2 or 3 miles from the shore, it is impossible to get it off.

Norton Bay, the head of *Norton Sound*, was partially explored by Mr. King, one of Cook's officers. From the heights, on the West side of the inlet, the two coasts were seen to join, and the inlet to terminate in a small river or creek, before which were banks of sand or mud, and everywhere shoal water.

Bald Head forms the north-western limit of this inner sound, and is about 25 miles to the north-westward of Cape Denbigh. On the West side of Bald Head the shore forms a bay, in the bottom of which is a low beach. At about 20 miles to the S.W. $\frac{1}{2}$ S. of this point the coast projects out into a bluff head, composed of perpendicular strata of a rock of a dark-blue colour. The soundings off this shore are very shoal, not being more than 6 fathoms at a league off, and decreasing to 3 fathoms and under to the eastward. The coast continues in a S. $\frac{1}{2}$ W. direction as far as Cape Darby, where it turns to the north-westward.

Cape Darby is in lat. $64^{\circ} 16'$, long. $162^{\circ} 44'$. Capt. Cook anchored off the coast between Bald Head and this cape in a quarter less 5 fathoms, half a league from the coast, the South point of which bore S. 26° W.; Bald Head, N. 60° E., 26 miles distant; and Besborough Island, S. 62° E., 15 leagues distant, true bearings. He states that all the drift-wood in these northern parts was fir.

Golovnine Bay, on the West side of Cape Darby, was discovered in 1821 by Capt. Khramtschenko. The natives here term it *Tatchik*. Its opening is limited on the East by Cape Darby, and on the West by *Cape Kamennoi*, or *Rocky*, lying about 9 miles W. by S. of the first. The latter cape was so called from a flat and bare rock close to it. These two capes are high and steep, but

Cape Darby is the highest. The bay extends first to N.N.W., and then to W.N.W. At 3 miles to the northward of Cape Kamennoi there is a bed of gravel across it, running off to the East from the West side. At 2 miles from the East side of the bay, which is opposite to it, it is terminated by a reef of uncovered rocks, which, at a distance, is extremely like an artificial pier or mole, whence it is called the *Stone Mole*, or *Kamennaia Pristan*. Beyond this the bay is very shallow.

There is anchorage in all parts of the outer bay as far as the Stone Mole: bring it to bear from West to W.S.W., *true*; within this the depth rapidly decreases. The bay is perfectly clear throughout; but, as it is open to winds from the South, the anchorage is not without some danger from this cause. Water may be procured from a small river, and on the West shore drift-wood may be collected.

The time of high water, the establishment, is 6^h 23^m. At full moon it rises 3 feet 8 inches.

The inner bay communicates with the outer by a narrow gullet. At its head a large river discharges by five mouths, which makes the water of the bay fresh.

Aziak, or *Ayak Island*, called by Cook *Sledge Island*, on account of a sledge found by him on it, is 10 or 12 miles S.E. $\frac{3}{4}$ E. of Cape Rodney, and is in about lat. 64° 30', long. 166° 7'. M. Tébenkoff thinks it is a mile in circuit, and he describes it as a rock rising 642 ft. above the water. A low point projects on its North side; and, on the East, a village stands on the slope of the rugged coast. The island may be approached on all sides. The anchorage is bad to the East, the bottom being of large stones. It is better to the North, near the point, although the current runs here 3 knots, but the bottom is much better.

Oukivok, or *King Island* of Capt. Cook, is a bare rock 756 ft. in height, not more than a mile in circuit, and cliffs on all sides, with deep water close-to. On the summits of the cliffs are a number of columnar stones. There is a village, the houses excavated in the rocks, on a rugged slope, at 150 or 200 ft. above the sea. The inhabitants appeared glad to receive a visit from the people of the U.S. steamer *Corwin*, and seemed to be in a prosperous condition. They live almost entirely by walrus and seal hunting.

POINT RODNEY is a low point to the N.W. $\frac{3}{4}$ W. of Sledge Island, and being low, and the water shallow, it is difficult to land. From the beach to the foot of the mountains there is a plain about 2 miles wide, covered with lichens and grass, upon which Capt. Beechey observed several herds of reindeer feeding; some narrow lakes extend several miles along the coast. Upon the beach is a greater abundance of drift-wood than is found on other parts of the coast. About 2 miles from the coast the country becomes mountainous, and far inland rises to peaked hills of great height, which are covered with perennial snow.

PORT CLARENCE, which was explored and named by Captain Beechey, August, 1827,* is 30 miles to the north-westward of Point Rodney. It was passed unnoticed by Cook in his passage through the strait, but this is not surprising, from the character of the land forming it.

Point Spencer, the North extremity of a low spit of land, projecting about 10 miles from the coast, forms the southern protection of this spacious harbour, and is in lat. $65^{\circ} 16' 40''$ N., long. $166^{\circ} 47' 50''$ W. It here forms a right angle, having a channel about 2 miles wide between its extremity and the northern shore. This southern side of Port Clarence is a low diluvial formation, covered with grass, and intersected by narrow channels and lakes. It projects from a range of cliffs which appear to have been once upon the coast, and sweeping round, terminates in the low shingly point before named, Point Spencer.

Near Point Spencer the beach has been forced up, by some extraordinary pressure, into ridges, of which the outer one, 10 or 12 ft. above the sea, is the highest. Upon and about these ridges there was a great quantity of drift timber, but more on the inner side of the point than on the outer.

The northern and eastern shores of Port Clarence slope from the mountains to the sea, and are occasionally terminated by cliffs. The soil is covered with a thick coating of moss, among which are a few plants. The valleys and hollows are all filled with dwarf willow or birch.

GRANTLEY HARBOUR forms an inner harbour to the extensive and excellent bay just described. The channel into it from the outer harbour is extremely narrow, the entrance being contracted by two sandy spits; but the water is deep, and in one part there is not less than 12 fathoms. At the upper end of the harbour is a second strait, about 300 yards in width, formed between steep cliffs; but this channel, too, is contracted by sandy points. This strait communicates with a large inland lake. Capt. Beechey found three Esquimaux villages here.

"These two ports," says Capt. Beechey, "situated so near Behring Strait, may, at some future time, be of great importance to navigation, as they will be found particularly useful by vessels which may not wish to pass the strait in bad weather. To the outer harbour, which for convenience and security surpasses any other near Behring Strait with which we are acquainted, I attached the name of Port Clarence, in honour of His Most Gracious Majesty, then Duke of Clarence. To the inner, which is well adapted to the purposes of repair, and is sufficiently deep to receive a frigate, provided she lands her guns, which can be conveniently done upon the sandy spit at the entrance, I gave the name of Grantley Harbour, in compliment to Lord Grantley."

It is high water in the port, on full and change, at $4^h 25^m$.

Point Jackson, named, like Point Spencer, from a distinguished naval officer,

* Port Clarence was for a long time previously known to the Russians as *Kaviyak Bay*, but they did not know that it contained its excellent port.—*Lütke*.

forms the North side of the entrance to Port Clarence. Off it the water is more shallow than usual.

The harbour has frequently afforded refuge and shelter to our ships since Admiral Beechey surveyed it. The Franklin Search Expedition of 1848—1854, which went via Behring Strait, made it more or less their head-quarters. H.M.S. *Enterprise*, Capt. Collinson, came here in 1851. The *Plover*, Capt. Moore, and afterwards Capt. Maguire, was stationed here as a reserve or store ship to the other vessels engaged in the search in 1851—1853. H.M.S. *Rattlesnake*, Commander Trollope, also wintered here October 5th, 1853—June, 1854; so that this remote and sequestered spot has received much attention.

Grantley Harbour, after this, sprang suddenly into short-lived importance in 1866-7, as it was the spot selected for the landing of the Behring Strait electric cable from the Asiatic shore. During the winter of 1866-7, Capt. Libby, of the Western Union Telegraph Service, wintered here, and spent the summer, with 40 men, leaving a good station and other houses when the enterprise was abandoned. It is a central point at which the natives of Kotzebue and Norton Sound, and the neighbouring country, meet the Tchuktohis from the Siberian coast. Many whalers annually visit this harbour for trading purposes, and Mr. Whymper says that it is possible that a permanent white settlement might be formed in this remote place. It is a good spot to winter in, but supplies from the resources of the country are very uncertain.

Cape York, named after the Duke of York, is a bold promontory, and near it there is probably a river, called *Youp-nut* by the natives. From hence to Cape Prince of Wales the coast is of quite a different character to that to the northward of the latter, being bounded by steep rocky cliffs, and broken by deep valleys, while the other is low swampy ground.

CAPE PRINCE OF WALES is the westernmost extreme of America. This celebrated promontory is the western termination of a peaked mountain, nearly 2,600 ft. high, which, being connected with the main by low ground, at a distance has the appearance of being isolated. The promontory is bold, and remarkable by a number of ragged points and large fragments of rock lying upon the ridge which connects the cape with the peak. About a mile to the northward of the cape some low land begins to project from the foot of the mountain, taking first a northerly, and then a north-easterly direction, to Schischmareff Inlet.

The natives have a village upon the low land near the cape, called *Eidannoo*, and they are reported to be the worst people on the coast, having several times attempted to seize the vessels of the traders. About 14 miles inland from Eidannoo there is a remarkable conical hill, often visible when the mountain tops are covered, which, being well fixed, will be found useful at such times by ships passing through the strait. At 12 miles farther inland the country becomes mountainous, and is remarkable for its sharp ridges. The altitude of

North Pacific.

one of the peaks, which is nearly the highest in the range, is 2,596 ft. These mountains, being covered with snow, when the *Blossom* was here (August, 1827), gave the country a very wintry aspect.

Off the cape is a very dangerous shoal, appearing to extend 6 or 7 miles to the N. by W. $\frac{1}{2}$ W. from it, upon which the sea breaks heavily. It takes the direction of the current, and is extremely dangerous, in consequence of the water shoaling so suddenly, and having deep water within it. The *Blossom* was nearly lost on it in 1827. The whalers report that this shoal is extending.

BEHRING STRAIT separates America from Asia. A vessel sailing in mid-channel can see both continents at once. At its narrowest part, between Cape Prince of Wales and the East Cape of Asia, it is about 49 miles wide, but in mid-channel are the Diomed Islands. It is, comparatively, very shallow, not exceeding from 20 to 30 fathoms in depth, and much of it less than this, so that it will not admit of any deep floating icebergs to drift southwards. On this account it was considered that a submarine telegraph cable, between Grantley Harbour and Cape Choukotskoi, on the Siberian shore, would be quite safe from any injury from this cause. In passing through the strait, the officers of the *Corwin* noticed that the water was of a brownish tint.

The **DIOMEDE ISLANDS** are two small islands and a rock occupying a conspicuous geographical position, as they lie between the nearest points of the two great continents of Asia and America, being thus in the very narrowest portion of Behring Strait.

They have been the subject of some slight dispute as to their real number. Our celebrated Capt. Cook places *three* islands here in the middle of the strait. Kotzebue imagined that he saw a *fourth*. The subject was set at rest by Capt. Beechey, in the *Blossom*, in 1826. They are *three* in number.

The south-eastern of the group is a high square rock, almost inaccessible, named by Capt. Beechey *Fairway Rock*, and by the native who drew a chart of this region, Oo-ghe-e-ak. It is an excellent guide to the eastern channel, which is the widest and best. The central island was named, after the Admiral, *Krusenstern Island*, and by the above-mentioned authority, Igna-look. It is an island with perpendicular cliffs and a flat surface. The third, or north-western one, which is the largest, was named by Capt. Beechey, after Kotzebue's supposed discovery, *Ratmanoff Island*, and Noo-narbook by the native. It is 3 miles long, high to the southward, and terminates, in the opposite direction, in low, rocky cliffs, with small rocky points off them.

They were visited by Mr. W. H. Dall, in September, 1880, and he describes these islands as granite domes, rising abruptly from the water. There were two villages, one on each island, the inhabitants chiefly subsisting on the innumerable birds. The boundary line between Russia and Alaska passes through the channel between the two islands, in long. $168^{\circ} 58' 5''$ W. The current near these islands was reversed by the tide, the rate not exceeding 3 knots, running diagonally across the strait.

From Cape Prince of Wales the coast trends to the northward, the water being shallow just to the North of it, as before stated.

The coast itself is low, with a ridge of sand extending along it. The land behind is marshy in the summer, and extends without anything remarkable for 35 miles to the narrow and intricate entrance of *Schischmareff Inlet*, which has not been explored. From hence to the north-eastward the coast is low and swampy, with a ridge of sand in front of it, terminating at Cape Espenburg.

Cape Espenburg, or *Spanberg*, about 30 miles from Schischmareff Inlet, and the western point of entrance to Kotzebue Sound, is a low flat point with some high sand-hills on it. Near the end of the cape is a native village. A bar of sand is stated to extend nearly 2 miles off this coast.

KOTZEBUE SOUND is a large indentation to the eastward of Cape Espenburg, with a moderate depth of water throughout, from 5 to 12 fathoms. At its head is *Eschscholtz Basin*, extending for 10 miles to the eastward from its entrance, the depth gradually decreasing from 4 fathoms to 1 fathom, where the *Buckland River* runs into it. At the entrance of the basin lies *Chamisso Island*, in lat. $68^{\circ} 13' 11''$ N., long. $161^{\circ} 46'$ W., rising to a height of 231 ft., and having a cross on its summit, bearing the names of the *Blossom*, *Plover*, &c. It is about $1\frac{1}{4}$ mile long, and has several streams from which water may be obtained in the early part of summer, but later in the season the streams become dry. The land about this part of the sound is generally characterized by rounded hills from 600 to 1,000 ft. high, with small lakes and rivers.

Between Chamisso and the South end of *Choris Peninsula*, 2 miles to the northward, vessels can enter the basin with a fair wind, avoiding the shoal extending about a mile off the peninsula. Within the island, and half a mile from the shore of the peninsula, there is anchorage in 5 fathoms, good holding ground.

From Choris Peninsula the coast trends 13 miles north-westward to *Cape Blossom*, and here commence some shoals which line the coast to the westward, extending as far as 8 miles off, and the soundings give very short notice of its proximity. *Hotham Inlet*, off which this shoal lies, is a broad sheet of water extending 30 or 40 miles to the south-eastward. At its mouth and at Cape Blossom are the principal trading places of the natives of this part.

From hence the coast trends away to the westward, and becomes more barren. In lat. $68^{\circ} 7' 45''$ N., long. $165^{\circ} 54'$ W., is *Cape Thompson*, a bold headland, where the *Corwin* procured an abundance of good water, but the anchorage is bad. About 28 miles beyond this is *Hope Point*, with shallow water off it, and intersected by lakes and creeks. Capt. Beechey, in passing along this coast, found a northerly surface-current of $1\frac{1}{2}$ to $3\frac{1}{2}$ miles per hour in July and August.

CAPE LISBURNE, of Captain Cook, is about 38 miles northward of Hope Point, and rises to a height of 849 ft. Here the coast turns to the eastward nearly at right angles, and becomes lower. About 30 miles from the cape, and

in lat. $68^{\circ} 50'$, long. $164^{\circ} 55'$, are some deposits of coal, several tons of which were shipped by the *Corwin*, and found to be of fair quality, very similar to the Seattle coal. There is good anchorage, with a southerly wind, within half a mile of the shore, in 4 fathoms. The locality is well marked by a peculiar headland about 400 ft. high.

From the rugged limestone mountains at Cape Lisburne there is a uniform descent to the rounded hills of sandstone at *Cape Beaufort*. The latter is situated in the depth of a great bay between Cape Lisburne and Icy Cape, and is the last place where the hills come down to the sea. At Cape Beaufort are some narrow veins of coal. From hence the coast trends more to the northward, and becomes fronted by a narrow strip of shingle or sand, having a lake within it extending for above 120 miles. Drift-wood was everywhere abundant.

Icy Cape, the farthest point reached by Captain Cook, is very low. Extending about 6 miles off it are *Blossom Shoals*, consisting of several successive banks, lying parallel with the shore, with from 2 to 4 fathoms over them. Vessels rounding the cape in thick weather should not come within a depth of 10 fathoms.

From Icy Cape the coast continues in one low unbroken line to the N.N.E., and is a flat or slightly rolling stretch of Arctic bog. The beach abounds with coal and drift-wood. At 40 miles from Icy Cape is a spacious opening or lake, named *Wainwright Inlet*, having a very narrow and winding entrance channel, with only 9 or 10 ft. water in it. Several native villages were seen on the coast beyond this. At 16 miles from this inlet is *Cape Becher*, where the coast turns more to the eastward. At 18 miles beyond it is *Point Franklin*, the outer point of a chain of low sandy islands named *Seahorse Islands*. A shoal, upon which the barque *Helen Mar* struck, extends 2 miles off the N.E. side of the cape. Capt. Hooper, U.S. steamer *Corwin*, reports that the bay within these islands, named *Peard Bay*, is entirely surrounded by shallow water. At *Ooglaamis*, near Point Franklin, the United States authorities have established a meteorological station. The coast from Cape Franklin to *Cape Smyth*, a distance of about 40 miles, is a succession of clay cliffs from 25 to 75 ft. in height, with a shingle or sandy beach. The land in the rear is low and flat.

POINT BARROW, 16 miles beyond Cape Smyth, is the N.W. extreme of America, in about lat. $71^{\circ} 23' 31''$ N., long. $156^{\circ} 15'$ W. It is a low spit of land making out about 6 or 8 miles from the regular coast-line, having a native village near its extremity. A shoal of $3\frac{1}{2}$ fathoms is reported to lie 6 miles N. by E. of the point.

ICY OR POLAR SEA.—This has been, and is, a vast field for the enterprise of the American whalers. The barrier of ice, extending from the shores of America to those of Asia, possesses all the peculiarities incident to the similar

natural features in other regions. It varies in its extent, or rather its encroachments, on the open sea to the southward of it in different seasons, and therefore no absolute description can be given of its limits. Icy Cape, on the American shore, would appear to be a frequent limit to its southern side.

The ice-pack seldom moves more than a few miles off shore between Icy Cape and Point Barrow, and is likely to close in at any time. A vessel going North of Icy Cape should sight the ice-pack frequently, keeping close watch of its movements, and in the event of its starting inshore should get below Blossom Shoals as soon as possible.—*Capt. Hooper, U.S.S. Corwin, 1880.*

There is one feature of this sea which might appear somewhat remarkable, and that is its shallowness. There is anchorage almost all over it. The depth varies from 20 to 30 fathoms, seldom exceeding the latter; the bottom composed of sand, mud, and stones. This, therefore, simplifies the navigation during the few weeks that it may be said to be open to navigation. It has been traversed in almost every portion; and, with the exception of Herald Shoal, discovered by Capt. Kellett, no permanent danger appears to exist in the open space between the shores of the two continents. *Herald Shoal*, upon which 7 fathoms was the least depth found, lies in about lat. $70^{\circ} 20' N.$, long. $171^{\circ} 5' W.$ Captain Kellett was of opinion that much shoaler water existed upon it.

Herald Island, discovered by Capt. Kellett, H.M.S. *Herald*, in 1849, is described as being about $4\frac{1}{2}$ miles long, East and West, a solid mass of granite, about 900 ft. high, almost inaccessible. It is in about lat. $71^{\circ} 20' N.$, long. $175^{\circ} 22' W.$, and was taken possession of in the name of H.M. Queen Victoria. *Plover Island* lies about 23 miles to the S.S.W.

WRANGELL ISLAND, which had previously been considered as part of an Arctic continent, was discovered to be an island by Lient. Berry, U.S.S. *Rodgers*, 1881. It is about 70 miles long East and West, and 35 miles broad, including the sand-spits making out 6 to 10 miles from the North and South coasts. A range of high hills extends completely around the island near the coast-line, and a lower range extends from East to West through the centre. One peak near the centre, *Berry Peak*, was found to be 2,500 ft. high. Several streams were found, and a few bears were seen near the coast.

On August 25th, at 10 a.m., the *Rodgers* sighted Cape Hawaii, the S.E. point, and soon after the ice surrounding the island was encountered, seemingly a dense pack. Skirting the edge of the pack a lead was discovered at 4 p.m. which was followed, and at 10 p.m., after having passed through about 10 miles of ice, the vessel anchored in 6 fathoms about half a mile from the shore.

Rodgers Harbour.—This small but excellent harbour, where the *Rodgers* was anchored for 19 days, is 7 or 8 miles westward of Cape Hawaii, and is formed by a bight in the coast-line, just East of a projecting promontory. It is a little more than 200 yards in extent either way, with a depth of from 3 to $3\frac{1}{2}$ fathoms in the centre. The observation spot, near the western extremity of

the low sandy neck on the South side, is in lat. $70^{\circ} 57' N.$, long. $178^{\circ} 10' W.$ The rise and fall of the tide was 5 ft. ; the flood tide sets to the southward and westward.

Having thus described the shores of Alaska, and the adjacent islands in the Sea of Behring, it remains to describe the detached islands now belonging to the United States, which are found in it. In this we have derived much information from the voyages of Capts. Lütke, Cook, Billings, Kotzebue, Beechey, and other navigators, including the reports of more recent American and other observers.

ST. LAWRENCE ISLAND, called *Enguae* by the natives, is the northernmost of those which lie in the open sea, and was discovered by Behring on St. Lawrence's day, August 10th, 1728. He stated that he passed by it without observing anything particular on it, except the cottages of some fishermen.

Captain Cook gave it the name of *Clerke Island*. It was seen by Captain Kotzebue, who examined the East and S.E. sides, but did not observe the union of the East and West portions.

From this cause, beyond doubt, the islands Macarius, St. Stephen, St. Theodore, and St. Abraham of Lieut. Syndt, are only the higher hills, which are all that are seen of St. Lawrence at a distance. Cook thus named a part of its extreme Anderson Island.

In 1828 Capt. Schischmareff made a detailed examination of its shores, with the exception of that part examined by his former commander, Capt. Kotzebue, in 1817. On the S.W. side is a small open bay, where the officers of the *Rurick* landed; this spot is readily recognised by the small rocky island in its vicinity.

From these and later examinations it appears that the island is about 85 miles in extent E. $\frac{1}{2}$ S. and W. $\frac{1}{2}$ N., with an average breadth of 20 miles. The N.W. point, to which Admiral Krusenstern gave the name of the Russian surveyor, *Schischmareff Point*, is in lat. $63^{\circ} 52' N.$, long. $171^{\circ} 30' W.$ The N.E. point of the island is in lat. $63^{\circ} 15'$, long. $168^{\circ} 36'$, the coast between the two being much indented.

The islet which Cook saw near this latter point, in about lat. $63^{\circ} 5'$, long. $168^{\circ} 45'$, is composed, according to Kotzebue, of two islets: Schischmareff says there are three. The inhabitants call the eastern part of the coast *Kaegalak*, and the western *Chiboko*. The eastern point of the island is named Cape Anderson, and here an historic doubt existed.

A shoal of 11 fathoms was found by the *Blossom* precisely in the situation assigned to a small island named by Cook after his respected surgeon, Mr. Anderson. This island had never been seen after, and the veracity of the great navigator had been in consequence impeached. Capt. Beechey, however, recti-

fied this error, having found that it was intended for the East end of St. Lawrence Island.

The island is inhabited by a few Esquimaux families, and Capt. Hooper, of the U.S. steamer *Corwin*, 1880, states that the natives are the best looking found in the vicinity. The men are strongly addicted to rum, and will barter anything they possess to procure it, and so long as it lasts will do nothing but drink and fight. Their number has decreased of late years, consequent upon intemperance, sickness, and starvation.

The Swedish steamer *Vega* anchored, in July, 1879, in an open bay on the N.W. side of the island. Professor Nordenskiöld states that it is very dangerous to stay long here with a vessel, for there is no known haven on its coast. In consequence of the heavy swell, when the sea is clear of ice, it is difficult to land on the island.

ST. MATTHEW ISLAND was discovered by Lieut. Syndt, in August, 1766. Captain Cook, ignorant of this circumstance, considered it as a new discovery in 1778, and called it *Gore Island*. He only saw the S.E. part from a distance, and probably only made out the small island, now named *Hall*, lying separately to the North, which the Russian promychlenniki call *Morjovi* or *Morse Island*. Since Cook's time it has been seen by several Russian navigators. Sarytscheff anchored here; Schischmareff passed close to it. On the Russian charts it has always borne its original name, *Matvoi*, or St. Matthew; but to preserve the name by Cook, Lütke named the West extremity of the island *Cape Gore*.

In 1874 it was visited by Mr. H. W. Elliott and Lieut. Maynard, U.S.N., who found the island tenanted by large numbers of polar bears.

St. Matthew Island lies W. by N. $\frac{1}{4}$ N. and E. by S. $\frac{1}{4}$ S., and in a direct line is about 22 miles long, and $3\frac{1}{2}$ to $4\frac{1}{2}$ miles in breadth. Its shores consist partly of high rocks, partly of low land. The S.E. extremity of the island, most justly called by Cook *Cape Upright*, rises out of the water like a wall to the height of 1,400 ft., and this is the highest point of the island. It falls suddenly to the N.W., forming a very low and very narrow isthmus; not being seen beyond 4 or 5 miles, it causes Cape Upright, even at this distance, to appear as a separate island. Beyond this isthmus the island increases in breadth and elevation, and then again contracts, forming another isthmus, similar to the first, at 9 miles from it, then a third, from which formation St. Matthew at a distance appears like several islands. The S.E. or outer point of Cape Upright is in lat. $60^{\circ} 18'$, long. $172^{\circ} 4' W$.

About 8 miles W. by S. $\frac{3}{4}$ S. from this cape is *Sugarloaf Cape*, thus named from an extremely remarkable mountain which surmounts it. This mountain is 1,438 ft. in height, and on every side appears as an irregular cone, the only one on the island. Between Cape Sugarloaf and Cape Upright are two bays, entirely unprotected, surrounded by low shores. On the North side of the Sugarloaf is a similar bay, and an isthmus similar to that connecting Cape

Upright. From this towards the W.N.W., as far as the West extreme, Cape Gore, are almost perpendicular rocks, intersected in many parts by ravines. *Cape Gore* terminates to seaward in a low cliff, and off it are some rocky islets. At 3 miles from the North end of the island, on the coast quite by itself, is a remarkable rock, of a rhomboidal form.

The North point of the island, named by Capt. Lütke after Capt. Sarytscheff's vessel, is in lat. $60^{\circ} 38'$, long. $172^{\circ} 41'$. It is steep, but much lower than Cape Upright. The eastern shore of the island much resembles the opposite one. There are corresponding bays on either side, which form the narrow isthmuses.

Hall or *Morjovi Island* is steep on every part except the S.W., and is separated from the N.W. end of St. Matthew by Sarytscheff Strait, less than 3 miles in width. Its North extreme, in lat. $60^{\circ} 34'$, long. $172^{\circ} 42'$, equals Cape Upright in elevation, and much resembles it. The South end extends in a low point to the S.E.

Pinnacle Island, justly so named by Cook, lies 16 miles S.W. $\frac{3}{4}$ W. from Cape Upright. Two sides, nearly perpendicular, unite at the elevation of 990 feet in a pointed crest, with a number of pointed rocks on it. At the steep S.W. extremity are some isolated rocks; and the N.E. point terminates in an entire range of connected and extraordinary pointed rocks.

The shores of St. Matthew are clear, and the depth very great. There might not be great difficulty in landing in the bays in fine weather. The island is not inhabited, and is scarcely capable of being so. The formation of the island is volcanic.

PRYBILOV ISLANDS.

These are a group of two volcanic rocky islands, and two small islets, discovered by M. Prybilov in 1786; this officer was under Capt. Billings' expedition, in 1790. At first they were called *Novy* (new); then *Lebedevski*, from the name of the owner of the vessel which discovered them. M. Chelekov called them *Zouboff*; more recently they have been called *Kotovy* (sea-bears), and *Severny* (North), from the immense quantity of sea animals found there, and their position relative to Ounalashka. Admiral Sarytscheff has placed them on his chart under the name of the officer who discovered them, as here repeated. They are most commonly called in the colonies here *Ostrovki*, the Little Islands.

They are at present noted for the immense quantities of fur-seals, walrus, &c., which frequent their shores. In 1870 the United States Government granted a twenty years lease of these islands to the Alaska Commercial Company, the latter having the exclusive right, and being entitled to take annually not over 100,000 seal skins. The seals annually begin to arrive here early in May, for breeding purposes, and in July, some parts of the shores, known as

rookeries, are covered with hundreds of thousands of these animals. In October they begin to depart, and by the beginning of January they have all disappeared. They are most carefully protected, only the young males being taken for their skins.*

The inhabitants are some of them descendants of the Aleutians brought here by the Russians, and are all comfortably off, the Company having provided them with decent houses, two churches, schools, hospital, &c.

The *climate* of these islands is as humid and disagreeable as possible. Verdure does not show itself until the end of April or May. Dense fogs prevail in summer, the atmosphere is rarely clear, and the sun is still more rarely to be seen. Snow falls in October. In December North winds bring the ice, which remains here frequently until May. The lowest average temperature of a usual winter ranges from 22° to 26° F. The summer temperature ranges between 35° and 64°.

It is sometimes difficult to find these "small islands" in the condensed fogs which prevail here. At times the land may be seen from the mast-head, when below it is very thick.

A great many attempts have been made to raise a few of the hardy vegetables, but with the exception of lettuce, turnips, and radishes on St. Paul Island, nothing has been or can be done. It is also next to impossible to keep cattle, sheep, or poultry, during the winter. No species of wood grows on the islands, but drift-wood is found on their eastern parts. Fresh water is procured from lakes or rivulets.

ST. GEORGE ISLAND, the southernmost island, is a little over 10 miles in length, East and West, and about 4½ miles across where widest. It rises sheer and precipitous from the sea all round, except at three spots where there is landing, at Garden Cove on the East coast, at the village on the North coast, and at Zapadnie Bay on the S.W. side, off each of which there is anchorage. The loftiest summit, southward of the village, rises to a height of 930 ft. Capt. Lütke says the aspect of the S.E. coast is very monotonous, only one point rising above the rest on its level surface. The surface of the N.W. part is perfectly flat, and is covered with grass. Capt. Beechey states that the island consists of two hills united by moderately high ground, and is higher than St. Paul Island.

The coast in general is clear, and has a depth of 16 to 20 fathoms around it; a stony kelp bed at Zapadnie, and another eastward of the village, being the only hindrances to a ship's sailing boldly round the island.

* Most valuable and exhaustive accounts of these islands, and their marine visitors, will be found in two Reports, by Mr. H. W. Elliott, on the Seal Islands of Alaska, published at Washington, U. S., one in 1873, and the other in 1881. Both these most interesting Reports are embellished with numerous illustrations.

The village, consisting of about two dozen houses, and containing 92 inhabitants in 1880, is situated near the centre of the North coast. Here the coast slopes inward, and is covered with a thick herbage. A small cove between the rocks serves to shelter the baidars, and you may even anchor there in South and S.E. winds. At a mile off there is 17 fathoms, black sandy bottom; farther in there is anchorage in 10 fathoms, but the steamer is frequently unable to venture in for weeks at a time. The village is stated to be in lat. $56^{\circ} 39' 16''$ N., long. $169^{\circ} 19'$ W.

A shoal of 5 fathoms, marked by kelp, is reported to lie 13 to 15 miles north-eastward of the East end of the island. It was seen in 1824 by Capt. Chramtschenko.

ST. PAUL ISLAND lies 34 miles N.W. $\frac{1}{2}$ W. of St. George, which is 183 miles N.W. $\frac{1}{2}$ W. from the N.W. point of Unalashka, the channel between the islands being free from danger. It is about 13 miles in length between its N.E. and S.W. points, and about 6 miles across where widest. The eastern, southern, and northern parts of the island are low, and the coasts sloping and sandy; but the West side is hilly, and terminates to seaward in a high steep cape, which is distinguished by a remarkable height surrounding it. There is on the East side of the island another volcanic hill equally remarkable, 550 ft. high, and near the centre is another of the same elevation as that at the West end, viz., 600 ft. Capt. Beechey says that St. Paul is distinguished by several small peaks, which have the appearance of craters.

The northern and western shores are said to be free from danger up to within half a mile, but extending off some of the projecting points on the southern and eastern shores are several large rocky reefs.

The island is extended to the southward by a low bed of sandy gravel, on the West side of which is the village and the Company's buildings. There are about eighty houses here, the population amounting to 298 in 1880, 14 of whom were whites. Off the village, either East or West of it, is the best place for anchorage in these islands, but with southerly winds a vessel must leave. Between this and the West end of the island the coast curves into a bay, and forms some small coves, in one of which there is said to be tolerably good shelter for small vessels. The greatest rise of tide is said to be not over 4 feet.

Reef Point, the southern extremity of the island, in lat. $57^{\circ} 8'$ N., long. $170^{\circ} 12'$ W., is about a mile from the village, and has a reef stretching about half a mile south-westward of it. At 5 miles S.W. $\frac{1}{2}$ S. from Reef Point, and about 7 miles S. by E. $\frac{1}{2}$ E. from the West end of the island, is *Bobrovi* or *Sea-Otter Island*, a small bluff island, about 3 miles in circuit, rising in a precipitous form from the sea, except on its northern side where it is low. On its S.E. extremity is a curious crater hill. A reef extends northward and south-westward of the N.W. point. Some hidden dangers are stated to lie between this and St. Paul.

About 5 miles E.S.E. from the N.E. point of St. Paul, which is surrounded by a reef, is a low and rocky islet named *Morjovi*, *Morses*, or *Whale Island*, over which the sea washes in storms. It is much frequented by sea-fowl, and bears N.E. $\frac{1}{2}$ N. about $14\frac{1}{2}$ miles from Otter Island.

A reef is marked on the chart as lying 10 miles West of the S.W. point of St. Paul, and another at 3 miles S. by W. from the same point. At 12 miles to the E.N.E. of its N.E. end a bank is stated to uncover at low water. A rock is also reported to lie about 90 miles N.E. by E. $\frac{1}{2}$ E. from the same point.

THE COAST OF ASIA.

The merit of discovery of this coast is due to Behring, as we have repeatedly remarked previously. It had been slightly and cursorily examined by few subsequent to that great navigator's first voyage until Captain Cook saw it, and first declared its true character. Captains Clerke and King passed along it in the following year. Capt. Kotzebue in the *Rurick*, Capts. Billings, Sarytscheff, and Wrangel, also added slightly to our knowledge. But all these authorities collectively gave a very vague and imperfect notion of the whole. All this, however, was obviated by the surveying expedition under Captain (afterwards Rear-Admiral) Lütke, whose excellent and ample work leaves little to desire. This expedition, which left St. Petersburg in August, 1826, consisted of two corvettes, the *Moller*, under Capt. Stanikowitch, and the *Séniavine*, under Capt. Lütke. The operations of the latter are our present object. After making many excellent observations in the North Pacific, he proceeded to Avatcha Bay, and thence surveyed the greater portion of the coasts of Kamchatka and Eastern Asia to the northward, as far as the East Cape of Behring Strait. The account of this voyage has furnished us with most of the subsequent particulars.

The *Tchuktohis*, the inhabitants of Eastern Asia, may demand a short notice here. Of all the Asiatic races inhabiting Siberia these are the only ones that have not submitted to the tribute of peltries demanded by the Russians.

The *Tchuktohis* inhabit the north-eastern part of Asia, extending from Tchaun Bay to Behring Strait in one direction, and in the other from the Anadyr, and the upper coasts of the Aniui, to the Polar Sea. To the South are the Koriaks, and to the West the *Tehuwanzes* and *Jukahirs* of the Aniui. The *Tchuktohis*, though still in a great measure a nomad race, have less of the characteristics which usually accompany such a mode of life than the wandering Tunguses; they are more covetous and more saving than belongs to the character of the genuine nomad races. They are disgraced by the most shameless licentiousness. Some of them possess large herds of reindeer, which are driven from place to place in search of pasturage, and are also used for riding. At times the meat may be procured in abundance, and cheaply. The wares most in demand are large sewing and darning needles, pots, large knives, axes, saws, and other tools, linen and woollen shirts, neckerchiefs, tobacco, and sugar.

They have been found to be more friendly than earlier writers have given them credit for, and were serviceable to Captain Moore when he anchored here in 1848-9, and also to visitors in more recent times.*

CAPE NORTH of Captain Cook, or *Ir-Kaipie* according to Admiral von Wrangel, is the most northern point of the Asiatic coast made by Captain Cook, and is in lat. $68^{\circ} 55' 16''$ N., long. $179^{\circ} 57'$ E., according to Admiral von Wrangel. The coast here is similar to that of the opposite American coast, low land near the sea, with elevated land farther back. There is a village here.

Koliutchin Island, in lat. $67^{\circ} 27'$ N., long. $174^{\circ} 10'$ W. (South point), is about 4 or 5 miles in circuit, with a steep rocky coast, about 3 leagues from the main. Southward of it is *Koliutchin Bay*, a large indentation in the coast.

Eastward of this the Swedish steamer *Vega*, which left Karlskrona June 22, 1878, and had accomplished the North-East Passage to this part, in one season, anchored in about 5 fathoms, 1,400 yards from the land, on September 28th, 1878, off the village of *Pillekaj*, and was here suddenly frozen in, in lat. $67^{\circ} 4' 49''$ N., long. $173^{\circ} 23' 2''$ W., though open water was seen a few miles to the eastward for some days after. The vessel was released July 18th, 1879, and then proceeded for Europe via Behring Strait. The natives were very friendly. A full account of this successful expedition will be found in the work mentioned in the note below.

CAPE SERDZE KAMEN, in lat. $67^{\circ} 0'$, long. $171^{\circ} 55'$, was the limit of Behring's voyage, August 15th, 1728. Captain Cook describes it as a moderately lofty promontory, with some elevated rocks upon it, and a steep rocky cliff facing the sea. To the eastward of it the coast is high and bold, but to the westward it is low. There are two villages in the bay westward of it.

EAST CAPE, the extremity of Asia, has been mentioned before as forming, with Cape Prince of Wales, the westernmost point of America, the narrowest part of Behring Strait. It is a peninsula of considerable height, joined to the continent by a very low, and, to appearance, narrow neck of land. It shows a steep rocky cliff against the sea, from which it rises to a height of 2,100 ft., and off the extreme point are some rocks like spires. It is in lat. $66^{\circ} 3'$ N., long. $169^{\circ} 44'$ W. From its general appearance it might be taken for an island, and this doubtless occasioned an error in the number of the Diomed Islands lying off it. Professor Nordenskiöld proposes to name this cape *Deschnev*, after the Cossack who, in 1648, made a voyage from the River Lena, through Behring Strait, to the mouth of the Anadir. From its summit the American coast is plainly visible. On its North side is the village of *Udile*.

ST. LAWRENCE BAY, about 33 miles to the S. by W. of East Cape, was so named by Cook, he having anchored in it on St. Lawrence's day, August 10,

* Further particulars of the natives will be found in Mr. W. H. Dall's valuable work, "Alaska and its Resources," and also in Professor A. E. Nordenskiöld's "Voyage of the *Vega* round Asia and Europe," translated by Alexander Leellie, 2 vols., 1881,

1778. It is remarkable that Behring sailed past it just half a century before, that is, August 10, 1728, on which account the neighbouring island was called St. Lawrence Island.

The bay was minutely surveyed by Capt. Lütke in July, 1828, and here commence the sailing directions given by that navigator, corrected, where necessary, from later information. *Cape Nouniagmo* is the N.E. extremity of St. Lawrence Bay, and is distinguished by a remarkable hill, not from its elevation, but from its rounded summit. *Cape Krleougoun*, which forms the S.W. extremity, is $11\frac{1}{2}$ miles S.W. by S. $\frac{1}{2}$ S. from it. The western slope of this mountain declines very gradually to form a large opening, through which runs a rapid but shallow river, on which is a village of stationary Tchuktehis, named Nunamo or Nouniagmo, 2 miles from the cape of the name. *Cape Pnaougoun*, beyond which commences the interior bay, is $3\frac{1}{2}$ miles to W. by S. from this village. Between these the shores are level and low, terminating abruptly at the seashore. From these escarpments, entirely covered with snow in July, avalanches were constantly falling with great noise. Not a single shrub breaks the monotony of the interior plains.

Cape Krleougoun is high and very steep; beyond it the coast turns rapidly to the westward towards Metchigmensk Bay. Upon this cape there is a mountain, very remarkable from some sharp peaks. It is a very well determined position on the chart. The cape is in lat. $65^{\circ} 29' 40''$ N., long. $170^{\circ} 50'$ W. At half a mile from its extremity is a village.

From this cape the coast extends, rounding to the North and N.N.W., for 7 miles, where a bed of gravel projects, forming a tolerably large lake. It is $3\frac{1}{2}$ miles S.W. by S. from Cape Pnaougoun, and may be taken as the other point of the inner bay. Above it is a village.

The depth in the centre of the bay is 27 fathoms. At 1 or 2 miles from the North shore there is 5, 6, and 9 fathoms, sand and gravel; farther off the depth rapidly increases. At 1 or $1\frac{1}{2}$ mile from the South shore there is from 7 to 12 fathoms, muddy bottom; on approaching the inner bay the depth increases, and opposite the bed of gravel there is 23 fathoms. No indication of reefs or dangers was perceived.

These gravel deposits will be found to be so frequent in occurrence, that they certainly form a moiety of the entire coast between East Cape and the South extremity of Lopatka. A summary description of them may therefore be here given. What is meant by a *bed of gravel* is a formation or collection of shingle, rising from a few inches to 6 or 7 ft. above the surface of the water. They are generally covered with a turfy moss and plants similar to those on the land. They generally extend in a straight line, or gradually and slightly curve. They sometimes form distinct islands, and sometimes join on to the continent, forming the coast itself, or else points projecting from it. Their breadth varies; some are almost washed over by the sea, and none exceed a mile. There is generally a great depth on their edges, and frequently at 10 or

12 yards off there is 4 or 5 fathoms. At 2 or 3 miles off the depth gradually increases, the bottom frequently muddy; so that, wherever one of those gravel beds is met with on the coast, so sure are you to find anchorage. Nevertheless it sometimes occurs that detached and similarly deep banks lie before these. In digging holes in these banks water is found at the level of the sea, but always among the shingle.

Such shingle banks are met with in other regions, but nowhere so frequently as in the seas of Behring and Okhotsk. They are seen at every step, and a glance is sufficient to demonstrate that they are formed by the sea, but in what manner is not so evident.

The inner bay extends West and W.N.W. for 19 miles, and throughout maintains nearly an equal breadth of $3\frac{1}{2}$ miles. The opening is rather narrowed by a low gravel bed, at half a mile westward of Cape Pnaougoun. Its distance from the South Cape is $2\frac{1}{2}$ miles. Here is the chief entrance, where there is more than 27 fathoms water, and no danger. In the East passage there is not more than 11 ft. water.

Cape Pnaougoun and the coast, for a mile distant, are formed by a bed of gravel; farther off, though low, it is perpendicular, and covered with snow. Extending from Cape Pnaougoun to the N.E. and W.N.W. it forms a cove, now named *Lütke Harbour*, $1\frac{1}{2}$ mile long and wide, in which is secure anchorage.

At the extremity of St. Lawrence Bay the termination of a chain of high and peaked mountains abuts, which has every appearance of being a branch of the chain traversing the Tchuktschi country from East to West, and joining the Stanovoi chain. Two small rivers flow into the head of the bay.

But few birds or fish, for provision, were seen here; a few salmon were all that were procured. But these privations were amply compensated by the abundance of reindeer which was procured from the wandering Tchuktschis, always near the coast in the autumn, for iron articles, &c., or, above all, for tobacco. During the last few years vessels touching here only found a few miserable natives encamped on the shores.

Fresh water is to be had, and of very excellent quality, but not everywhere readily procurable. Capt. Lütke took his from a brook 1 mile from Cape Pnaougoun; it may be taken from the beach by means of a hose. On the other hand, not a morsel of wood can be got. It is worthy of remark that, although the opposite or American coast abounds with it, both growing and drift, not a single piece is brought here by the sea. The tides are very insignificant; the greatest difference observed was 15 inches; and were usually very irregular. As near as could be ascertained, the establishment of the port was $4^h 20^m$. The currents are strong, but apparently as irregular as the tides. The winds are generally light; those between South and East bring the fog.

The observations made upon the bed of gravel make its West point lat. $65^{\circ} 37' 30''$ N., long. about $170^{\circ} 43' 30''$ W.

METCHIGMENSK BAY.—From Cape Krleougoun the coast turns rapidly to the westward, and, curving in an open bay, extends for 20 miles to the W. by S. to a moderately elevated but very steep cape, on which is the large village of *Lugren*. The coast appeared clear, without any danger. A bed of gravel, separating Metchigmentsk Bay from the sea, extends from Cape Lugren for about 10 miles to the S.W. by W., curving to the South.

The entrance to the bay is very difficult, from its narrowness and the lowness of the points forming it. Before making them out, the people on them will be seen, as if walking on the water. The entrance is so placed, that its opening cannot be made out until it is brought to bear N.W., and consequently when near the western side. It must thus be sought from the mast-head, like the opening to a coral reef, which, in foggy weather, is impracticable. The best mark to find the entrance is a cape on the North of the bay, which, on the continental side, projects to the South. It is tolerably high, even, and ends in a low point to the S.W., appearing, at a distance, like two or three islands. The northernmost and longest of these apparent islands, which is distinguished by a cliff, lies W.N.W. from the entrance. Bringing it on this bearing, and steering for it, you go right for the entrance.

The village of *Metchigm*, on the West side, at 2 miles from the point of the gravel bed, is a sure mark. The winter yourts show themselves by a thick verdure on and around them. The Bay of Metchigmentsk penetrates the land for a great distance. The remarks as to supplies at St. Lawrence Bay equally apply to this. The entrance of the bay was assumed to be in lat. $65^{\circ} 30' 30''$, long. $172^{\circ} 0' W$. The bed of gravel which forms the West side of the entrance extends 5 or 6 miles to the N.N.E.

At 15 miles S.E. by S. of Metchigmentsk Bay *Cape Khaluetkin* projects, very remarkable for a round-topped mountain. To the S.S.E. of the cape is *Héliaghyn Bay*, surrounded by a very low coast, apparently terminating in an inner bay.

Thence the coast turns to S.E. by S. to *Cape Nygtyhygan*, which, from North and N.E., at 15 miles distant, appears to be an island, on account of the lowness of the land between it and *Héliaghyn Bay*. It is steep; to the N.W. of it a bed of gravel extends 3 or 4 miles, which unites at its other end to the coast, forming a lake or bay. Southward of Cape Nygtyhygan is the opening of the extensive Strait of *Séniavine*.

STRAIT of SENIAVINE.—The existence of this remarkable strait was not suspected until the voyage of Capt. Lütke, who applied the name of his vessel to it. It is formed by two large islands, *Arakamtchetchen* and *Ittygran*. It runs first towards the S.W., then South, and to the East, nearly 30 miles, and from 6 miles to half a mile in breadth. Its North entrance is between *Capes Neegtychan* and *Kougouan*, bearing S. $\frac{1}{2}$ E. and N. $\frac{1}{2}$ W., 5 miles apart, and is named by the natives *Tchiarloun*. Each of them is distinguished by tolerably high mountains. *Neegtychan* lies at the distance from the coast; but

Kougouan falls perpendicularly into the sea, and was distinguished by Cook. Cape Neegtehan, in lat. $64^{\circ} 55' 30''$ N., long. $172^{\circ} 20'$ W., is the northern limit of the strait; as *Cape Mertens*, in lat. $64^{\circ} 33' 15''$, long. $172^{\circ} 24'$, is its southern extremity.

At 2 miles from Cape Neegtehan is the small river *Maritoh*. Its mouth is a good harbour for small vessels, as they can moor against the land. Near the mouth, to the N.W., is the Tchuktehi village, *Yaniakinon*. *Konyam* or *Penkegnei Bay* extends beyond the entrance, first W.N.W. 5 miles, then as far to S.S.W., then 2 miles to W.S.W. It is surrounded by high mountains, advancing to the coast itself. It is deep and safe.

The shore at the S.E. part of Konyam Bay, in which the *Vega* lay at anchor for a couple of days, consists of a rather desolate bog. Farther inland several mountain summits rise to a height of nearly 2,000 ft., split up into pointed summits. Three Tchuktehi families were living near the bay, and were friendly.

Abolecheff Bay.—The continental coast from Penkegnei Bay runs 6 miles to S.S.W. to Abolecheff Bay, partly steep, partly sloping, but mountainous throughout. Its opening is in front of the South point of Arakamtchetohen Island, and it thence extends 6 miles to the W.S.W. and S.W., with a breadth of 1 to $1\frac{1}{2}$ mile. Its North shore consists of a gravel bed, behind which, at a short distance, high mountains rise, among which *Tagleokou* is remarkable for its perfectly conical summit. The upper part of the bay is surrounded by a very low and sandy shore. There is good anchorage throughout above the second cape; but to be perfectly sheltered you must double the third cape, and lie in 17 to 19 fathoms, sticky mud. Fresh water abounds everywhere, but no wood to be obtained.

Abolecheff Bay had a short-lived dignity, which it is very unlikely to regain. It was selected by the officers of the Western Union Telegraph Company as the landing-place for the submarine cable which was to connect the New and the Old Worlds, from Grantley Harbour on the American side, as related on p. 697, *ante*. The enterprise was abandoned.

From the first or S.E. cape of Abolecheff Bay the coast runs 5 miles to S. by W. $\frac{1}{2}$ W., and forms a bay open to the North. The surrounding mountains will not permit a ray of the sun to penetrate into it; it is, therefore, cold, sombre, and frozen. From this icy bay the coast runs 3 miles to the E.N.E., and approaches the West extremity of Ittygran Island. A bay on the latter corresponds to a gravel bed running to the N.E., and is made remarkable by the high pyramidal mountain, *Elpyngbyn*; the two together form a sheltered harbour, with 9 to 20 fathoms.

From the mountain Elpyngbyn the coast trends evenly to the East for 6 miles; then with steep, reddish cliffs, 2 miles farther to Cape Mertens, the South termination of Seniavine Strait.

Cape Mertens is high, steep, and is distinguished by a mountain with three summits. Between it and Elpyngbyn Mountain there is no shelter.

Arakamtchetchen Island, or *Ka-y-ne*, the largest of the islands forming the Strait of Séniavine, is 16 miles long S.W. by W. and N.E. by E., and $8\frac{1}{2}$ miles in its greatest breadth. From the S.W. point to nearly one-half its length, it is traversed by a chain of hills, moderately high, with flattened summits; the highest of which, *Mount Athos*, has two separate granitic rocks crowning its summit, a short distance apart. **Cape Kyghynin**, the East point of the island, and the easternmost point of the land forming the Strait of Séniavine, is in lat. $64^{\circ} 46' N.$, long. $172^{\circ} 1' W.$, and 28 miles E. by N. $\frac{1}{2}$ N. from the bottom of Penkegnei Bay, the western extremity.

Port Ratmanoff, at 2 miles S.S.W. from Cape Kougouan, is small but good, and is preferable to all others on account of its proximity to the sea. It is easy to make out by Cape Kougouan and another cape equally steep but lower, at $3\frac{1}{2}$ miles S.W. of it; Port Ratmanoff is midway between them. The port is formed by a gravel bed, extending 1,000 yards S.W. from the coast it joins. A portion of the space behind it, $1\frac{1}{2}$ cable in diameter, has 24 to 36 ft. water, muddy bottom. Vessels can moor to the gravel bed, where neither wind nor swell can incommode them. At $2\frac{1}{2}$ cables from the South point of the bed is an isolated sand-bank, with 8 ft. water over it; this point must therefore be kept not more than 150 or 200 yards off in rounding it. Water may be got from a rivulet at the South point.

Cape Paghelian, the S.W. extremity of the island, is 8 miles from this port, the coast between being low and nearly straight. There is good anchorage in the slight bay formed by it, and tolerable shelter. Cape Paghelian is the extremity of a bed of gravel, and is scarcely above the surface of the water. From its commencement the rocky shores run $1\frac{1}{2}$ mile to the eastward, rising quickly to form the *Meinghyngai Mountain*, conspicuous from its rounded top. Then begins a gravel bed, which, trending in a curve to S.E. and S.W., forms the excellent road of *Glasenapp*. The extremity of this gravel bed, called *Yerghin*, is $1\frac{1}{2}$ mile to E. $\frac{1}{2}$ S. from Cape Paghelian; there was a small village on it. There is good anchorage in the bay thus formed, in from 10 to 16 fathoms, mud. You may even moor to the gravel bed.

From this cape the gravel bed runs 2 miles to the N.N.E. to a pointed and steep cape; then the shore gradually trends to *Cape Ryghynin*.

Ittygran Island, 2 miles to the South of the previous island, is 6 miles long E. by N. and W. by S., and 2 or 3 miles broad. Its N.W. extremity is distinguished by a blackish and perpendicular rock. From thence the North coast of the island runs directly E. by N., and then turns to E.S.E., to S.S.E., and S.S.W., to *Cape Postels*, the S.E. extremity of the island, lying 3 miles N.W. by W. $\frac{1}{2}$ W. from Cape Mertens, and $2\frac{1}{2}$ miles from the nearest part of the continent. This forms the breadth of the South entrance to the Strait of

North Pacific.

Séniavine, called by the Tchukcheis *Tchatchekouioum*. *Cape Postels* is distinguished by a moderately high hill, with a perfectly round top. *Kynkai Island*, which is not more than three-quarters of a mile in circuit, lies $1\frac{1}{2}$ mile to S.W. $\frac{1}{2}$ S. from Cape Paghelian. It is moderately high and rocky, with a bare flattish summit. *Nounaangan*, a small rocky islet, is outside the strait, lying $4\frac{1}{2}$ miles N. by E. $\frac{1}{2}$ E. from Cape Mertens. It is about 80 ft. high and cliffy, covered with verdure.

One remarkable feature of the Strait of Séniavine, which also occurs at the Bay of St. Lawrence, is, that in these straits, enclosed by coasts, the depth is greater than in the middle of the adjacent sea, which does not exceed, except in some parts, 24 fathoms. On the American coast the depth is not great; but it is still more singular that this depth is separated from the shallower open sea by a bank with still less water over it; so that the soundings first decrease on approaching the coast, and then increase when on it. In the middle of Behring Strait the depths diminish equally on either side.

The tides were almost imperceptible two or three days after the new moon, but a strong North wind raised the level, temporarily, 2 or 3 ft.

The wind naturally affects the atmosphere; with those between North and West it is clear; the South brings clouds; and S.E. moisture.

Vessels coming to trade generally visit the Bay of St. Lawrence, but this doubtless will be, or has been, abandoned for the Strait of Séniavine, the latter being 60 miles farther South, and more sheltered from ice and North winds. Its superior ports, too, are a great advantage. For a short stay, and to procure water, *Glasenapp Bay* will be found excellent. If a longer stay is to be made, *Abolcheff Bay* will answer. Should it be necessary to entirely discharge a vessel and heave her down, *Ratmanoff Bay* offers every facility. The Strait of Séniavine also offers more trade, because the Reindeer Tchukcheis assemble here in greater numbers, from the superiority of the pasturage, even over those of the Bay of Anadyr.

Cape Tchaplín.—The coast from Cape Mertens runs to S.E. by S. $\frac{1}{2}$ S. The mountains recede into the interior, and from the coast a bed of gravel projects, which, trending in a curve to E.S.E. and E.N.E., forms the long point called Cape Chaplin or Tchaplín, in lat. $64^{\circ} 24' 30''$, long. $172^{\circ} 14' W$. At the commencement of this bed of gravel high mountains, with pointed summits, advance to the shore.

CAPE TCHOUKOTSKOI.—From Cape Tchaplín the coast trends towards the S.W. by W. for 8 miles, and then turns to the N.W., forming *Tskagen Bay*, a large indentation with 17 fathoms in its entrance. From the West point of this bay the coast again trends S.W. by W., 10 miles, and then turns to W. by N. Capt. Lütke considered the southernmost point of this extent of coast as Cape Tchoukotskoi or Choukotski. It is a bluff headland, declining in a narrow crest, from which rise some high pointed rocks. It is in lat. $64^{\circ} 16'$, long. $173^{\circ} 10' W$. Beyond this commences the Gulf of Anadyr.

The GULF of ANADYR.—The S.W. limit of this gulf may be placed at Cape St. Thaddeus, lying 210 miles S.W. $\frac{1}{4}$ W. from Cape Tchoukotskoi. With this breadth in its opening, the gulf is 420 miles in circuit, without reckoning the smaller sinuosities and Holy Cross Bay or the Gulf of St. Croix, which is 180 miles in circuit. It appears to be free from danger, with the exception of a patch of $1\frac{1}{2}$ fathom, which is marked on the United States chart near its centre, in lat. $64^{\circ} 16' N.$, long. $178^{\circ} W.$

Up to the time of the visit of Capt. Lütke, Behring had been the only navigator who had sailed in it. The Gulf of Anadyr (pronounced *Anarder*, and not *Annie-dear*, Mr. Whymper says) was visited by the Western Union Telegraph Company in 1865-7.

On the eastern side of the bay *Mount Dionysius*, a mountain of no great height, on the South side of the entrance of Anadyr River, is the only landmark of the district.

Three large rivers enter the bay, two of which are the *Arnoura* and the *Anadyr*. The last is navigable for 300 miles, and has no rapids of importance in that distance. It is subject to violent freshets in the spring, and then rises 15 or 20 ft. above its usual level, flooding the country in all directions.—*Travels in Alaska*, &c., pp. 115, 117.

Along the North coast of the bay, no sort of danger was perceived from the *Séniavine*, and the bottom is gravelly. It must therefore be considered that it is clear throughout, because Behring, who kept close to the land all the way beyond the cape now bearing his name, does not either make mention of any shoal or reef whatever. The eastern angles of the gulf are the portions which have the least depth.

From Cape Tchoukotskoi the coast extends to W. by N. Capt. Lütke here went off the land, so that he did not examine the coast immediately to the westward of Cape Tchoukotskoi, and this is the part that since his survey has been of great interest, as Port Providence was used by the Franklin Search Expedition in 1848-9, and by the Telegraph expedition of 1865-7. At 12 miles to W. $\frac{1}{4}$ N. from this cape we reach *Cape Stolétié* (of the century), which much resembles the former, of a blackish colour, and having, in a similar manner, isolated rocks on its crest.

At $7\frac{1}{2}$ miles from Cape Stolétié, *Cape Ouliakhpen* projects in a steep declivity, and is high. The rocks of this cape, and also of those farther to the north-westward, are not so black as those which extend towards Cape Tchoukotskoi; and the isolated and pointed rocks on their crests are not seen here. On the East side of this cape is an open bay, into which the small river *Vouten* falls.

PORT PROVIDENCE or **POLOVER BAY** is the first opening westward of Tchoukotskoi, and, as stated above, is not marked on Capt. Lütke's chart. It afforded winter shelter for H.M.S. *Plover* (Commander Moore) in 1848-9, which was despatched in search of the missing expedition of Sir John Franklin.

It consists of an inlet extending to the northward, terminating at its northern end in two arms named *Cacho* and *Vladimir Bays*. On its East side, at its southern part, are two harbours named Plover Bay and Emma Harbour. Bare cliffs and rugged mountains hem it in on three sides, and many-coloured lichens and mosses are the only vegetation seen, except on a patch of open country near Emma Harbour, where domesticated reindeer graze.

Plover Bay, which is frequented by whalers, lies just above the entrance of the inlet. It is extensive, with safe anchorage in 18 fathoms, protected from the sea by a long, low spit of land, but the holding ground being slaty and poor, it is unsafe in heavy northerly gales. Otherwise it is a very secure haven, and it is no uncommon thing to find several whaling vessels lying inside in the summer. A supply of water could be conveniently obtained. There is a Tchuktochi village on the spit; their tents are composed of skin, stretched over a frame built of the large bones of whales and walrus. The commander of the *Corwin* represents the inhabitants as drunken and worthless.—(See Lieut. Hooper's *Tents of the Tuskii*.)

On the East side of this bay is *Slavianska Bight*, where the Russian government has established a coal depôt. In 1876 the bay was visited by Lieuts. Onatsevich and Maximov, of the Russian Navy, who made a partial survey. The observation spot, at the head of a small bight on the West side of the bay, was determined to be in lat. $64^{\circ} 21' 55''$ N., long. $173^{\circ} 23' 54''$ W. In 1880 the officers of the U.S. schooner *Yukon* deduced the long. as $173^{\circ} 21' 32''$ W.

Emma Harbour, in which the *Plover* wintered, communicates with the larger one by an opening a mile wide, 4 miles above Plover Bay, forming a basin 4 miles long, and $1\frac{1}{2}$ mile in breadth, surrounded on every side by lofty mountains, except to the southward, where it is separated from the sea by a tract of low land and an extensive lagoon, and having deep water at the entrance and middle, with good anchorage on each side close to the shore. On the low land to the South was a native settlement, to which belonged a large herd of reindeer. The natives were very friendly.

Plover Bay, as before stated, was selected as the Siberian Station for the Western Union telegraph cable, leaving Grantley Harbour on the American side. A station was built, and the line was commenced toward the Amoor, through a most rugged and difficult country, and one of the party, Mr. Bush, made the entire journey from the Amoor, a distance of at least 2,500 miles, in the winter of 1855-6, a feat which deserved to rank as the most remarkable of many undertaken by members of this expedition.

Cape Uakkoun, like Cape Ouliakhpen, is very high and steep. It is conspicuous, from a pyramidal rock rising from its summit.

Cape Tching-an falls from a great height, almost perpendicularly, into the sea. It is very remarkable by a red band which intersects the cape from its summit to its base.

From Cape Tching-an the coast, consisting chiefly of perpendicular rocks,

trends to N.W. by W. $\frac{1}{2}$ W. and W. $\frac{1}{2}$ N. as far as *Cape Spanberg*, which is high, and in lat. $64^{\circ} 42\frac{1}{2}'$ N., long. $174^{\circ} 36'$ W. On the South side of the cape is a high steep rock, with a rounded top, and on the West side is a hill equally rounded, the flanks of which gradually slope on either side. Between this cape and *Cape Halgan*, 9 miles distant to the West, a bay penetrates into the land.

Cape Halgan is high and very steep, and in front of it is a large detached rock. *Cape Ninirlioun* is as high and as bluff as the preceding, and in general the intervening coast is equally so. This cape is very remarkable by its flat top, but more so from its entirely different appearance from that which follows it, *Cape Attcheun*, in lat. $64^{\circ} 48'$, long. $175^{\circ} 28'$. This latter cape, moderately elevated, is steep to seaward.

Transfiguration Bay.—The coast extends in a winding manner 4 miles north-westward to a small open bay, which Lütke recognised as Behring's Bay of Transfiguration or Preobrayenia. It is surrounded by a low shore, and towards its extremity it receives the *River Ledianaya* (frozen), which the Tchukchis call Kouivaem. From this bay the coast is high, nearly perpendicular, and like a wall; it extends 9 miles to *Cape Enmelian*.

CAPE BEHRING is equally high and perpendicular, and is situated in lat. $65^{\circ} 0' 30''$ N., long. $175^{\circ} 48'$ W. It is particularly noticeable, because here suddenly terminate the steep rocks which, with small exceptions, form the entire extent of coast as far as Cape Tchoukotskoi, and farther North the coast becomes still lower. The mountains in this space are similar to those at Cape Tchoukotskoi: of a moderate height, level at the summit, sloping, and even flat, which particularly characterises the mountains about Cape Ninirlioun. The high and peaked mountains, like those in the Bay of St. Lawrence, will no longer be seen, even in the distance. From Cape Behring the coast turns abruptly to N.E. by N. $\frac{1}{2}$ N., then to N. by W. $\frac{1}{2}$ W., sloping gradually, and terminating perpendicularly in some parts, as far as *Cape Tchirikoff*, which is steep, with a peaked summit, and forms an open bay. Some villages were seen.

Beyond this only a single bluff and high cape can be distinguished, lying 4 or 5 miles N.W. by W. $\frac{1}{2}$ W. from Cape Tchirikoff. The coast thence trends towards the mouth of a large river, from whence it takes a westerly direction. At 10 miles from the mouth of the river, the lead only gave 6 to 7 fathoms. All the eastern shore of the Gulf of Anadyr is destitute of wood.

To the westward of the river above mentioned, the coast is low for 4 miles, and then commences to become hilly. The mountains, higher than those on the East coast, are peaked or flat at the summit, but all are dispersed without any order. The coast in this form extends 15 miles West, forming a small open bay, into which a small river falls, and terminated on the South by a high bluff cape. The bottom of the bay is in lat. $65^{\circ} 36\frac{1}{2}'$, long. $176^{\circ} 48'$, and is properly the northern extremity of the Gulf of Anadyr.

At 3 or 4 miles from this last river the most remarkable bed of gravel that

had been seen commences. It extends without interruption to S.W. by S. $\frac{1}{4}$ S. and W. by S. $\frac{1}{4}$ S. for 45 miles, as far as Cape Meetchken, in the Gulf of St. Croix, and consequently forming the largest portion of the North coast of the Gulf of Anadyr. It is throughout nothing but a heap of bare shingle, with the exception of a very few spots, where there had been, or still was, a habitation. A narrow and shallow canal separates this gravel bed from the continental coast, which runs parallel to it, and bounds the sea with low reddish cliffs.

HOLY CROSS BAY, *Gulf of St. Croix*, or *Kresta Gulf*, occupies a space of 54 miles of latitude, and 35 miles from E.N.E. to W.S.W., and reaches within 10 miles of the Arctic circle. Its shores, to the distance of 35 miles from its entrance, run nearly parallel to each other, to N.W. $\frac{1}{4}$ N., and 20 miles apart. Farther on they approach each other, and narrow the gulf to less than 4 miles.

Cape Meetchken, the western extremity of the bed of gravel previously described, forms the East point of the entrance; it is in lat. $65^{\circ} 28' 40''$, long. $178^{\circ} 40' W.$ The shortest distance to the opposite shore to the West is $13\frac{1}{4}$ miles.

There is good anchorage on the North side of Cape Meetchken, open, however, to N.W. and W.N.W.; the coast in this direction, being 40 miles distant, affords not much protection. The depth is 5 to 9 fathoms, and the best place is to bring Cape Meetchken to bear S.W. Care must be taken, in entering, of the rocky bank, which lies $1\frac{1}{2}$ mile south-westward of the cape.

The eastern side of the gulf, the nearest part of which is 8 miles from Cape Meetchken, has but very little depth. There are no mountains whatever along the coast, which is a low cliff. Only near the entrance a branch of the mountains advances, of which the nearest to the gulf is called, by the Tchuktchis, *Linglingai*, meaning "heart rock," in Russian *Serdze Kamen*. It lies in lat. $65^{\circ} 36\frac{1}{2}' N.$, long. $178^{\circ} 5' W.$, and its height is 1,462 ft. above the sea.

At 26 miles from Cape Meetchken a tolerably large and high bed of gravel advances from the coast to the W.N.W., and forms a cove 2 miles in circuit, exposed to the N.W., in which there is safer anchorage than in that at Cape Meetchken. At about 8 miles from this point a long and low point projects, forming the South limit of the *Bay of Kanhynin*, which is nearly 6 miles wide at its opening, but is shallow.

The northern side of the gulf presents an entire contrast to those of the East and western sides. High mountains here advance in three abrupt capes, of a sombre appearance, forming between them *Egvekinot* and *Etelkouium Bays*.

Egvekinot Bay, at the head of the bay, penetrates 7 miles N. by W. $\frac{3}{4}$ W., with a breadth of 1 or $1\frac{1}{4}$ mile. The high mountains which surround it leave all round a narrow band of low shore. There is no part of the bay worthy of the name of a harbour. *Etelkouium Bay* lies by the side of the former. The depth in the entrance was 13 to 16 fathoms, muddy bottom, and it had every appearance of being a good port. At the entrance of the bay, on its North side,

a bed of gravel forms *Krusenstern Cove*. Quiet anchorage may be had within it in 7 to 12 fathoms.

At 10 miles to the westward of Etelkouiium Bay is *Engaoughin Bay*, at the N.W. angle of Holy Cross Bay. It is a round cove of 9 miles in circuit, sheltered from the South by a low point projecting 2 miles to the West, and by a gravel bed standing alone in front of the point. This forms an excellent harbour, the only one worthy of the character in the Gulf of St. Croix.

From this bay the western coast of the gulf runs South, and then curves gradually to the E.S.E., without forming a single remarkable bay or cove. At the distance of 10 miles from the port the mountains advance very near to the sea, and reach it in places with high cliffs. This side of the bay is distinguished by its superior depth; in the centre the depths are from 22 to 40 fathoms, muddy bottom.

The most remarkable mountain here is that of *Matatchingai*, at the bottom of Etelkouiium Bay. It is distinguished from all others as well by its elevation as by its sombre and rugged flanks. Its height was calculated at 9,180 ft.

On the West side, up as far as the Port of Engaoughin, a large quantity of drift-wood is found, even long and large trunks of trees; on the East and North coasts, on the contrary, not a single piece is met with. This circumstance is worthy of note; it proves that the current from the River Anadyr, from which it comes in entering the Gulf of St. Croix, bears chiefly to the West, although from the bearing of its shores the contrary would have been anticipated. On no part of the shores of the gulf is the smallest trace of growing wood to be met with.

The establishment of the port appears to be 8^h 50^m. The greatest rise was 7 ft., but usually it was 4½ to 5½ ft.; some former traces showed a rise of 9 ft.

THE RIVER ANADYR, which gives its name to the gulf which receives its waters, is the most considerable of those falling into the Sea of Behring. The Western Union Telegraph was intended to follow the course of the river up to some villages called *Anadyrsk*, some distance from its mouth. From this it was to cross over to the head of the Sea of Okhotsk at Tigil, thence proceeding to Ghijega.

The land round it is low, and in approaching the entrance of the inner bay, into which it falls, there is a very curious island, to which the telegraph party gave the name of *Sarcophagus*, from a supposed resemblance. The entrance to this bay is about 5 miles wide. On the shore large herds of domesticated reindeer graze.

The telegraph party who wintered on the Anadyr in 1867 found that blinding snow storms were prevalent during winter, and between log-houses, not more than 100 yards apart, it was found necessary to stretch a guiding rope for the men. Reindeer meat was obtained in great quantities.

CAPE ST. THADDEUS is the S.W. cape of the Gulf of Anadyr. Behring, perhaps, gave this name to a cape on August 21, (O. S.), being in lat. 62° 42',

and from his data the term has been defined to apply to the high bluff cape situated in lat. $62^{\circ} 42'$, long. $179^{\circ} 38'$ E.

Cape St. Thaddeus is the point which projects farthest to the East in this portion of the coast, while beyond the cape the coast turns to the N.W. and S.S.W., so that it forms a sort of natural limit to the Gulf of Anadyr. At 15 miles to the S. by W. $\frac{1}{2}$ W. is another high cape, to which Capt. Lütke applied the name of *King*.

Archangel Gabriel Bay.—From Cape King the coast turns suddenly to the westward, forming a bay, which penetrates the land to a depth of not less than 15 miles, with a breadth of 6 miles. To this bay Capt. Lütke gave the name of Behring's vessel.

CAPE NAVARIN.—From Archangel Gabriel Bay the coast runs S. by E. $\frac{1}{2}$ E. to this cape, in lat. $62^{\circ} 16'$, long. $179^{\circ} 4\frac{1}{2}'$ E. In addition to its conspicuous situation, Cape Navarin is remarkable for a high mountain on its point, 2,512 ft. in height, the flanks of which descend nearly perpendicularly into the sea.

Cape Navarin is the South extremity of the peninsula which bounds Archangel Gabriel Bay on the South. A chain of high mountains extends through it. *Mount Heiden* surpasses the rest in elevation (2,230 ft.), and is distinguished by its conical form. In the middle of September (1827) it was entirely covered with snow.

From the cape we have a long interval of coast, upwards of 350 miles in extent, of which we know next to nothing. Capt. Clerke passed it at a great distance, and Capt. Lütke, both in his progress to the North and on his return, was prevented by bad and foggy weather from making observations on it. This district is peopled by the Koriaks.

CAPE OLUTORSKOI, the first point described by Capt. Lütke, is in lat. $59^{\circ} 58'$, long. $170^{\circ} 21'$ E. It is remarkable by a high mountain with three summits (2,537 ft.) with a steep ascent from the sea. From this cape the coast extends on one side to N.W. $\frac{1}{2}$ N., towards the *Gulf of Olutorskoi*; and on the other 30 miles to N.E. $\frac{1}{2}$ N. In all this extent it is mountainous, and falls into the sea in cliffy headlands.

The Gulf of Olutorskoi was not examined by Capt. Lütke on account of the fog and its distance. Its western termination is a cape, which was supposed to be *Cape Govenskoï*, in about lat. $59^{\circ} 50'$, long. $166^{\circ} 18'$ E. It is high, bluff, and cliffy, and over it are some high mountains.

Cape Ilpinski.—From the latter cape the last-named coast trends in a curve W $\frac{1}{2}$ S. to Cape Ilpinski, where the coast suddenly becomes lower. This cape is in lat. $59^{\circ} 48\frac{1}{2}'$, long. $164^{\circ} 57'$. Projecting from mountains of a moderate height, it advances to the S.W. in an even point, not very high, and falling perpendicularly into the sea. According to Krachenninikoff, it is joined to the continent by an isthmus so low and narrow that the sea washes over it.

Verkhotoursky or *Little Karaghinsky Island* lies directly before Cape Ilpinski, and is in lat. $59^{\circ} 37\frac{1}{2}'$, long. $164^{\circ} 43'$. It is of a round form, and 3 or 4 miles in circumference. On all sides except the N.W., where it is low, it falls perpendicularly into the sea. The strait between the island and Cape Ilpinski is 12 miles broad, and nearly in the middle of it is a dangerous reef, awash, extending $1\frac{1}{2}$ or 2 miles East and West. In the centre is a small but high rock. A little to the northward is a stony islet, and it may be presumed that there are other dangers.

From Cape Ilpinski the coast curves to the West and S.W., forming a large gulf, which is bounded to the South by the large Island of Karaghinsky. As this bay forms one of the narrowest and the lowest portions of the peninsula of Kamchatka, it is usually taken as the northern limit of that country; the Bay of Penjinsk, in the Sea of Okhotsk, forming the opposite coast.

Although a small portion of the coast to the southward may be included in the shores of the Sea of Behring, we shall for the present quit them, leaving them to be described in connection with the peninsula in the next Chapter.

COMMANDER ISLANDS.

These two islands, Behring and Medny or Copper Islands, which still belong to Russia, do not in reality form a portion of the Aleutian Archipelago, but must be considered as a part of the chain connecting the volcanos of America with those of Kamchatka.

The first Russian navigators gave them their present name of the *Komandorski Islands*, in memory of one of the most tragic events in the annals of navigation—the death of Behring (known in these countries under his title of Commander), on the westernmost island, which now bears his name. Captain Lutke's voyage of the *Seniavine* has furnished us with the accounts of them. The Alaska Commercial Company maintain a station on each island for procuring seal-skins, &c. The inhabitants are about 300 in number.

BEHRING ISLAND is nearly 50 miles long N.W. $\frac{1}{2}$ N. and S.E. $\frac{1}{2}$ S. Its greatest breadth at the North end is 16 or 17 miles; to the S.E. it narrows, and forms a pointed cape, in lat. $54^{\circ} 42'$, long. $166^{\circ} 45'$ E. A chain of mountains, 2,200 ft. in height, extends throughout the island; in its centre are some peaks. They are in general higher in the South, and lower and more even in the North. There are several small rivers, frequented by fish when spawning.

The South cape, called *Cape Manati* by Behring's companions, is conspicuous by some high peaked rocks terminating it. From this the East coast trends N. $\frac{1}{2}$ W. in steep cliffs to *Cape Khitroff* or *Hitrova*, in lat. $54^{\circ} 56'$, long. $166^{\circ} 46'$ E. From this to the N.E. point, *Cape Waxell* or *Vaksel*, the coast trends generally N.W. by N. $\frac{1}{2}$ N. The N.E. extreme is an obtuse, low head, projecting 3 miles into the sea. Reefs project from its North and East angles

North Pacific.

to a mile or more, and it seems that all this coast is bestrewn with rocks. In the curve formed by the East coast is a small bay with a sandy beach, on which is a large quantity of drift-wood.

Cape Youchin, the low N.W. extremity of the island, is in lat. $55^{\circ} 21'$, long. $165^{\circ} 58'$ E. From this point a dangerous covered reef extends 3 or 4 miles to the North, on which, at nearly a mile from the shore, is a large uncovered rock. Between Capes Waxell and Youchin the coast forms an open bay, bestrewn with rocks, and about midway between them was a temporary establishment of the Russian-American Company.

From Cape Youchin the coast trends to S.W. to the West extremity of the island, in lat. $55^{\circ} 15'$, long. $165^{\circ} 48' 30''$; and thence to the S.E., in which direction, at 10 miles farther on, was the Company's factory, on the shore of a small bay open to N.W., where, in summer, is tolerably good anchorage in 4 or 5 fathoms, sand, at three-fifths of a mile from shore. This bay is called here the *port*: but it must be by contrast to the other unapproachable points. Two islets abreast of the village, due West, are good marks to make the port; the one, *Toporkoff*, is 2 miles, and the other, *Arii Rock* (Alcas Rock), at nearly 6 miles. Between the two, rather nearest to Toporkoff, is a sunken rock that only uncovers at low water, called *Polovintchaty*. To the north-eastward of this again are some indications of sunken reefs, so that the North sides of these islands should be avoided.

The S.W. coast of the island, from the port to the South extreme, is entirely unknown.

The spot where Behring died, as related on p. 662, is on the East side of the island, at three-quarters of a mile W.N.W. from Cape Khitroff.

The water is very deep around the island. At from 4 to 6 miles off the N.E. and North shores the depth was found to be 58 to 67 fathoms, muddy bottom on the North side; farther to the East, stony bottom.

MEDNY or COPPER ISLAND is remarkable for its long and narrow figure. The only island it resembles hereabout is Amlia. It is about 30 miles in length, and its greatest breadth towards the middle is not more than 5 miles; it frequently does not exceed 2 miles. It seems to be the crest of a mountain rising out of the sea in a S.E. $\frac{1}{2}$ E. and N.W. $\frac{1}{2}$ W. direction. Medny Island is scarcely lower than its neighbour, Behring Island; seen from the *Behring Cross*, as the spot where the commander perished is termed, it appears to consist of three islands. Its shores are very steep, clear in most parts, and the depth around very great. There are some reefs at its N.W. and S.W. extremities, and at some other points, but they do not extend far off. The island is entirely without anchorage for large ships; but on its N.E. side, at 10 miles from its N.W. extreme, is a small bay, where small vessels may ride, with 6 and 7 fathoms in its entrance.

The outer coasts of the bay are high; the S.W. side is clear, but on the East side is a multitude of isolated rocks and stones, which shelter the port a

little from the North. These rocks, and a high conical mountain on the S.E. side of the bay, serve as marks for entering. The rocks must be left to starboard, and then steer direct for the village, and as soon as you reach as high as a stone column on the West side of the little harbour, you must cast anchor instantly, and at the same time moor the poop to the shore, for there is no room for her to swing. You will have 2 and $2\frac{1}{2}$ fathoms at half a cable's length from the shore. The harbour is badly sheltered from the North, and to guard against North winds always keep a sufficient scope of cable.

The Company's establishment was on the South side of the harbour, in lat. $54^{\circ} 47'$. The latitude of the N.W. extremity of the island is $54^{\circ} 54'$, long. $167^{\circ} 32' 30''$ E.

Medny (Mednoi or Copper, as the Russian name signifies) was thus named on account of the native copper found here, and which was attempted to be worked in the middle of the last century, but the poverty of the mine led to its abandonment.

The *climate* of these islands is not very rigorous. There are no very intense frosts in winter, but they have at times very heavy snow storms. In January and February the N.W. and West winds bring the ice on the coasts in large quantities. The weather is clear with N.E. and East winds; it is overcast with those from East and S.E. There are no active volcanos on either of the islands, but earthquakes are frequent, the shocks of which are sometimes felt for a long time. The highest tides rise about 6 or 7 ft. There are no trees on either island, but in the lower parts are some bushes.

After violent and long-continued winds, a large quantity of drift-wood is thrown on to the shores, principally of those species that grow at Kamchatka, but sometimes the cypress that grows on the American coast, and even the wood which only grows at Japan. Sometimes, also, lacquered vessels of wood, of Japanese manufacture, have been found, which goes to prove that in this part of the ocean the currents trend to North or N.E.

The Aleutes say that in some parts of the strait, between the islands, there are sunken rocks, but, as they have not yet been seen, this may be doubted. One of 2 fathoms is marked on the chart, at about 10 miles W.N.W. from the N.W. end of Medny Island.

CHAPTER X.

KAMCHATKA, OKHOTSK, AND THE KURILE ARCHIPELAGO.

THE first country described in this Chapter is the great peninsula of Kamchatka. It lies between the parallels of 62° and 51° North latitude, and is consequently about 800 English miles in length. The honour of the first discovery of Kamchatka is attributed to Feodor Alexeieff, a merchant, about the year 1648. The conquest of the peninsula was completed in 1706, and it has ever since paid tribute, in furs, to the governor of Irkutsk. It was made a new province by Imperial ukase of December 14th, 1849, and formed of the territory under the administration of the sea-coasts of Kamchatka, and the district of Ghijinsk.

The natural limit of the peninsula would seem to be, as we have before stated, at the bay to the West of Cape Ilpinsk. The civil division extends beyond this to the River Olioutor.

The natives are of two races, the Kamtchadales and the Kariaks or Koriaks, whose territories are divided at Cape Oukinskoi. The Kamtchadales differ from them more in mode of life than physical conformation. They seem to partake of the Mongolian type.

Of the geography of the peninsula a few words may be said. Of the eastern coast, with the exception of the few points imperfectly seen or observed by Cook and other navigators, the only delineation that existed for a long period was that furnished by Behring. Capt. Lütke was despatched from St. Petersburg to minutely survey this coast in the *Seniavine*, in 1827-8. Delays and contrarieties prevented this being done to the extent intended, and only some of the more prominent features received the great attention which that commander was capable of exercising in this exploration. That officer's work was published in 1835-6. Professor Adolph Erman also employed some time in the examination of various points on land. It has since then been examined by Russian officers, and their chart was published in 1849-51. From these and later authorities the following description has been derived.

Kamchatka is pre-eminently a country of volcanos. Some of the highest peaks in the world surmount its mountain ranges. These mountains, which cover about two-thirds of the entire surface, form an irregular chain in a N.N.E. and S.S.W. direction. Many of their summits are in a high state of volcanic

action; and, considered as a whole, it may be supposed that they form a portion of the great volcanic belt which extends through Alaska and the Aleutian Islands, and is continued on through the Kuriles, Japan, and Formosa, to the Asiatic Archipelago.

In the principal range running North from Cape Lopatka, its South extremity, thirteen summits, with craters and hot springs, have been observed, one other height being isolated, and lying West of the main range. The most active of these are Assatchinskoi (8,340 ft.), Avatcha (8,760 ft.), and Klutchevskoi (16,131 ft.). During an eruption of the first, in 1828, the scoria and ashes were carried as far as Petropaulovski, 120 versts (80 English miles) distant.

There are no large rivers in Kamchatka. The configuration and formation of the peninsula preclude this. The largest is the Kamchatka River, which, however, is said to be capable of admitting vessels of 100 tons about 150 miles up the stream.

The severity of the climate has been exaggerated, though it is severe. In some of the sheltered valleys, which possess great natural beauty, the temperature is not very inclement. Perhaps a similar train of remarks would hold good both for Japan and Kamchatka, that there is great difference between the East and West faces of the country; the former differing from the piercing West winds passing over the ice and snow of the continent of Asia. Of course agriculture has been but little pursued. Its slender population know but few wants, and these are supplied from the produce of the chase, as bears, lynxes, otters, reindeer, foxes, &c. The skins of these form the principal export, and but few supplies can be calculated on by vessels touching here.

KARAGHINSKY ISLAND.—This island, and the adjacent coast, until the time of Lütke's exploration in 1828, had not been seen by any known navigator, except Syndt, since the time that Behring had seen one or two of its points through the fog.

It is 57 miles in length, and an uninterrupted chain of mountains traverses its length, declining towards the S.W., and rising again at the South end, forming a hill about 700 ft. in elevation. The western coast is of an insignificant height; all the shore of the North and East sides of the island is higher and steeper. This causes a great difference in the appearance of the opposite coast, the steep ascents, the rugged or rounded summits, frequently rising to 1,250 ft. above the sea, and an Alpine vegetation, give it a mountainous character.

Its N.E. extremity, *Cape Golenichteff*, in lat. $59^{\circ} 13'$, long. $164^{\circ} 40' E.$, is 23 miles South from the Island of Verkhotoursky. Its South end, *Cape Kruchennikoff*, in lat. $58^{\circ} 28'$, long. $163^{\circ} 32'$, is at the distance of 40 miles from Cape Oukinskoi, on the coast of Kamchatka. From the N.E. extremity to the S.E., in the centre of the island, a chain of steep mountains extends, of 2,000 ft. in height, on the two flanks of which are chains of less elevation.

At 13 or 14 miles from the S.W. end of the island the mountains decline

considerably in height, becoming more even and sloping, and at 6 miles from this extremity is a low isthmus of $1\frac{1}{2}$ mile broad, which, beyond 20 miles off, gives the appearance of a separation of the higher hills to the southward.

Beyond the S.W. end the coast trending to the East forms a bay open to N.N.E. and N. by W., but where there is very convenient anchorage.

At 31 miles from the S.W. end, and at 27 miles from Cape Golenichtcheff, a bed of gravel running off the N.W. coast extends 7 miles to the West and S.W. Its point, *Cape Sémenoff*, is $13\frac{1}{2}$ miles E. by S. $\frac{3}{4}$ S. from Cape Kouzmichtcheff on Kamchatka. It is low, and is from half a mile to 300 yards in breadth. With the coast it forms a bay, open to all the S.W. quarter; but, notwithstanding this, it is an excellent roadstead.

The depth in the strait separating Karaghinsky from the continent is from 13 to 27 fathoms, most commonly a muddy bottom. It seemed as if there was some bank at 4 or 5 miles to the S.E. of Cape Krachenninikoff, as a change in the colour of the water was observed, and the soundings rapidly decreased to 12 fathoms.

Cape Ilpinski, which has been before alluded to, is the North point of the large gulf which washes the eastern shores of the narrowest part of the Kamchatka Peninsula. It is in lat. $59^{\circ} 48\frac{1}{2}'$, long. $164^{\circ} 57'$, and is joined to the continent by a low and narrow isthmus, over which the sea washes.

Cape Kouzmichtcheff, the position of which is well determined as lat. $59^{\circ} 5'$, long. $163^{\circ} 19'$, is steep, and is conspicuous by the direction of the coast on either side, as to the northward it trends S.E. towards it, and to the southward it runs W.S.W.

Karaghinskaia or *Ukinsk Bay*, formed to the northward by Cape Kouzmichtcheff, penetrates the land for 9 miles in a N.W. direction, its breadth being from 4 to 8 miles. At the head of the bay the *River Karaga* discharges itself, in lat. $59^{\circ} 8'$, long. $162^{\circ} 59'$. The shores of the river itself are low, but mountains covered with wood rise at no great distance. A bed of gravel extends for 4 miles to the South of the mouth of the Karaga, and then the coast, but little elevated, turns gradually to the S.E., and forming a cape in lat. $58^{\circ} 55'$, long. $163^{\circ} 2' E.$, which is the southern limit of *Karaghinskaia Bay*.

Cape Oukinskoi, which was passed at a great distance by Captain Lütke, forms the southern limit of a very extensive gulf, 60 miles in extent from North to South, of which *Karaghinskaia Bay* may be placed on the North. *Cape Oukinskoi*, or *Natchikinskoi*, was considered by Capt. Lütke to be in lat. $57^{\circ} 58'$, long. $162^{\circ} 47' E.$ It is low and level; the position of the high and remarkable mountain upon it is probably determined with greater precision; its lat. is $57^{\circ} 54'$, and its long. $162^{\circ} 52'$. This cape is the boundary between the Kamtschadales and the (Sedentary) Kariaks; the first dwelling to the South, the second to the North of it. The coast thence extends for 25 miles to the S.E., to a cape marked on the charts as *Cape Ozernoi*, in lat. $57^{\circ} 35'$, long. $163^{\circ} 14' E.$ It is distinguished by a mountain slightly peaked.

The coast beyond this is formed of high and sloping mountains, and nothing remarkable occurs until the *River Stolbovskaja* is reached. The mouth of this river is very distinct, and is in lat. $56^{\circ} 40\frac{1}{2}'$, long. $162^{\circ} 39'$. At 10 miles from its mouth the coast begins to be mountainous, and continues so for 15 miles.

Cape Stolbovoi is a high cliff, in lat. $56^{\circ} 40\frac{1}{2}'$, long. $163^{\circ} 21'$ E., and before it are three detached rocks, one very large. The coast from the cape towards the *River Stolbovskaja* turns abruptly to the N.W., and soon afterwards to West and W.S.W. At 13 miles South from Cape Stolbovoi, in lat. $56^{\circ} 27'$, the chain of mountains is interrupted to give place to a very low valley, through which, to the W.S.W. from seaward, there was no elevation visible between the Klutchevskoi volcano. The coast in question trends nearly upon a meridian for 35 miles South from Cape Stolbovoi. Throughout this extent, with the exception just alluded to, the coast is high and mountainous, terminating on the sea-coast often in slopes, but with cliffs in some parts, but it is throughout fronted by an extensive reef. From the above distance the coast runs 12 miles to S.W. to Cape Kamchatskoi, and continues fronted by a reef.

CAPE KAMCHATSKOI.—There was some doubt as to which was the actual cape bearing this name. The coast here forms a sloping and slightly elevated cape, which, seen from the S.E. at a great distance, would have the appearance of a remarkably prominent point.

From Cape Kamchatka the coast runs N.W. and West to the mouth of the *River Kamchatka*, a tortuous stream of no great size, having the village of *Sharon* at its mouth. The entrance is marked by two small beacons, and has a depth of 11 ft. on the bar at high water. There is a high signal-house near a village 2 or 3 miles North of the entrance, and a pilot can be procured if required. The land in the vicinity is low and flat.

The river was ascended by Major Abasa, a Russian officer in charge of the Siberian part of the Western Union Telegraph expeditions, in August, 1865. He went from this to Tigil on the Sea of Okhotsk. *Nishni* (New) or *Lower Kamchatka*, near the mouth of the River Kamchatka, is the place to which Behring brought the naval stores, and built the boat in which he started on his voyage of discovery, July 20, 1728.

Klutchevskoi Volcano, the great mountain of Kamchatka, lies at the back of the bay to the westward of Cape Kamchatskoi, in lat. $56^{\circ} 8' N.$, long. $160^{\circ} 45' E.$ This volcano, called also *Kamchatskoi*, and surnamed *Klutchevskoi* or *Klocheffskaja*, from the name of the village *Klutchi* (springs), lying at its foot on the South or right bank of the River Kamchatka, is of a truncated, but very steep, conical form. On its S.W. and N.E. sides are two other but lower mountains, the first with a serrated summit, called by the Kamtschadales the *Needle*, the second even. The volcano bears W. $\frac{1}{4}$ S. from the mouth of the River Kamchatka, and the extremity of Cape Kamchatskoi is 80 miles E. $\frac{1}{4}$ S. from it. Capt. Lütke calculates its height as 16,502 English feet. Professor

Erman measured it as 15,766 English feet; he terms it the *Peak of Kliuchevsk*. Its height, as given on the Russian charts, is 16,131 ft.

Dr. Erman states that he saw it in a picturesque and sublime activity, and approached the burning lava, which poured forth a continuous stream, till he reached the height of 8,000 ft.

CAPE KRONOTSKOI, with a large detached rock off it, is in lat. $54^{\circ} 54'$, long. $162^{\circ} 33'$. The intervening coast between it and the river trends S.W., South, and then 30 or 40 miles S.E. by S. In the distance is seen the chain of high snowy mountains, extending to the Klutchevskoi Volcano. About 30 miles S.S.W. of the cape is *Cape Kosloff*, and it is reported that the coast northward of this is charted 15 miles too far East. Several rocks lie off the coast between these capes. The northern shores of the Gulf of Kronotskoi, which extend inward to the S.W. of the latter cape, were not examined by Lütke. The North shore is low near the sea.

Kronotskoi Volcano, 10,610 English feet in height, stands on the North side of the bay in question, in lat. $54^{\circ} 45'$, long. $160^{\circ} 37' E$. It appears to be entirely isolated, and may be seen at 120 miles distant. Kronotskoi Volcano, like that of Villeuchinski, has the form of a regular cone, but it seems to be less steep than the latter. To the left of it is a mountain, the summit of which was flattened, and close to it a peaked hill, probably the same that was overturned during the passage of the Chevelutch Mountain from its ancient to its present site.

Between it and Joupanoff Volcano, to the southward, many high mountain summits were seen, but not forming a continuous chain. In the southern part of the bay, at 30 miles to the northward of Cape Shipunskoi, a cape projects in the neighbourhood of which the mountains recede into the interior of the country, leaving only a low coast. From this cape to Cape Shipunskoi the coast is mountainous, and imperfectly known. It is said to be indented with deep bays and inlets.

CAPE SHIPUNSKOI, or Tshipunski, in lat. $53^{\circ} 6'$, long. $160^{\circ} 5' E.$, is the extremity of some level land, which advances 3 miles from the chain extending to the Joupanoff Volcano, and terminates on the sea-coast throughout in rocky cliffs 200 ft. high. Seen from the S.W. or N.E., it has the same aspect as that of a projecting and even cape, but on the S.E. the level appearance is confounded with the other mountains. Beyond the extreme point are some detached rocks, which seem to be united by a reef. Capt. Lütke observed a strong current off the cape which produced some overfalls.

Cape Nalatcheff, 22 miles W. $\frac{1}{2}$ N. from Cape Shipunskoi, is a high, steep mountain, the summit irregularly rounded, projecting in a point to the South. The coast to the eastward of it is low and sandy near the sea, and rises towards a chain of moderately high mountains, but which are steep, and terminate in peaks; these extend to Cape Shipunskoi. Viewed from the S.W., this chain seems interrupted in a part where *Betchevinskai Bay* opens. Trading vessels

used formerly to visit the little *River Vakhilkaia*, which debouches 5 miles N.W. of this bay. The little *River Kalakhtyrka*, which enters the sea at 7 miles from the lighthouse cape of Avatcha Bay, is pointed out by a rock of moderate height, whitened by the dung of the sea-birds, lying 2 versts (1½ English mile) to the South of it.

The coast between this river and Avatcha Bay is lofty, and terminates on the shore, in many parts, in high cliffs. This space is intersected in one part by a low isthmus, between the bottom of Rakovya Bay and the sea, across which the hunters who go to take birds from Toporkoff Island transport their canoes.

AVATCHA BAY.*

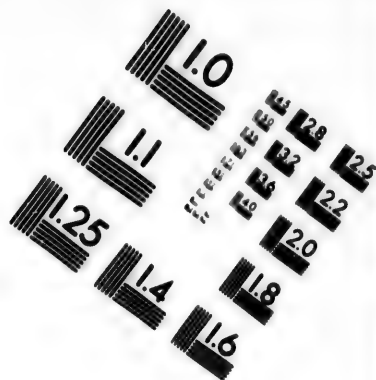
This bay, the principal port of the Peninsula of Kamchatka, derives its chief interest from its containing the port of St. Peter and St. Paul, Petropaulski, as much as from its intrinsic superiority. It is so extensive and excellent, that it would allow all the navies in the world to anchor in perfect security in its capacious basin. Yet the navigator in entering it will at first see no sign of human habitation or commerce on its shores, unless, perchance, some vessel may be approaching or quitting its only port, the little town above mentioned.

It was visited by Captain (afterwards Admiral) Beechey, in H.M.S. *Blossom*, in 1827, who made an accurate and ample survey of it. In the narrative of the voyage of the French frigate *La Venus*, under Capt. Du Petit Thouars, is a lengthened account of it commercially and nautically, and from these and later authorities we derive the following.

The Road of Avatcha, or the inner bay, lies at the bottom of the outer bay of the same name, and is about 10 miles in diameter, with an average depth of from 10 to 14 fathoms. It is reached through a narrow channel, which is 4 miles long, and about 1 mile broad. This strait, although thus narrow, is not dangerous, because there is anchorage throughout its whole extent; in it, as in nearly all close channels, the winds are almost always either directly in or out of it; that is, they are either contrary or favourable for passing it. In case of having to beat in, it is necessary to attend strictly to the leading marks.

The immense Bay of Avatcha, which leads to this channel, is formed by the retreat of the coast-line between *Capes Povorotni* or *Gavareah* and *Shipunskoi* or *Cheponskoi*; these two capes are the best landfalls for making the Port of Petropaulski. In fact, whether Cape Gavareah or Cape Shipunskoi is closed with, if the vessel should be overtaken in either of these positions by thick

* It is written *Awatska* by Admiral Beechey. Capt. Du Petit Thouars and others write *Avatcha*; Müller says *Awatscha*; or properly, according to Kamtschalian pronunciation, *Suaatcha*. Mr. Whymper says that, notwithstanding the variety of spelling, *Avatcha* is the distinct English pronunciation of the name of the place.



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fogs or strong winds from East or S.E., it is always possible to keep at sea; should the endeavour be to make the channel at once on its parallel, not only will the making the coast be retarded without any advantage being gained, but should she then be surprised by any contrariety, there is no means of making an advantageous tack in order to keep off, and the situation of the ship will be troublesome, there being no soundings on the coast, and neither do they offer any anchorage which could be taken in such circumstances.

If you arrive by night off the entrance to the bay, and the wind should be contrary for entering, it will be dangerous to attempt to enter the port without the assistance of a pilot, or unless well acquainted with it.

With contrary winds, with wind too light to steer, or during calm, the currents and narrowness of the entrance render the navigation difficult; but the possibility of anchoring throughout diminishes the danger. With a leading wind, the entering or leaving Avatcha Bay offers neither difficulty nor danger.

If the currents affect the steering, which, in a light breeze, frequently happens in the entrance, it is well to anchor in Ismenai Bay, on the East side of the entrance, or, if necessary, in any part of the channel.

LIGHT.—On *Dalni Point*, the eastern point of the entrance, a *fixed bright* light is shown, elevated 449 ft., and visible 24 miles, between E. by N. and N.W. $\frac{1}{2}$ W., round by South. It is only lighted occasionally, and owing to its great elevation it is often obscured by fog. Lat. $52^{\circ} 52' N.$, long. $158^{\circ} 47' E.$ There is telegraphic communication with Petropaulski.

The light may be approached without any risk, by means of the lead, and there is anchorage close to it.

There is no particular precaution necessary for safety in anchoring in Avatcha Bay. The sea is never so heavy as to occasion any trouble; but as the bay is surrounded by high mountains, violent gusts are sometimes felt, so that, for greater security and quietude, it is better to have a long hawser out. Lieut. Stephens, H.M.S. *Egeria*, says that vessels should moor.

The tidal currents are very irregular, both in form and duration; they were never found more than at 2 miles in the entrance, or $1\frac{1}{2}$ mile in the road.

Petropaulski Harbour, on the eastern side of this bay, is small, deep, and well shut in. It is defended by three raking batteries.* A vessel, of whatever size, can enter it, and undertake any description of repairs.

* During the Crimean war Petropaulski was attacked by an allied fleet of six ships, French and English, with a result by no means a subject of congratulation to us. On August 28th, 1854, the ships opened fire on the outer batteries, and the Russians returned it with great spirit. Ultimately an ill-judged landing was made of 700 men, during the unprotected march of whom almost all the officers were picked off. Having lost their leaders, the men fell back in disorder, and were repulsed with a loss of 107 English. The ships then bore off. This victory was the cause of very great surprise and self-gratulation to the defenders of this poor little town. When the fleet returned in the following spring, May and June, 1855, they found the place abandoned, and it fell, of course, a very easy prey.—*Mr. W'hymper.*

Tursinski Harbour, lying in the S.W. part of the bay, is extensive and excellent; but as there is neither population nor trade in it, it has, up to the present time, been of no utility.

Rakovya Harbour also forms, to the South of Petropaulski, an equally excellent port, but it is of less easy access than the foregoing, on account of Rakovya Bank, lying in the middle of the channel leading to it.

Winds.—In fine weather the morning breeze is from the North to N.N.W., lasting until 8 or 10 o'clock, and sometimes even until 11 o'clock; then, shifting to the West and South, it sinks altogether; in the afternoon, about 1 or 2 o'clock, the breeze from the offing sets in, varying from South towards East. After the middle of October the weather becomes wet, and then snow falls in abundance; the inner harbour becomes frozen over, and remains so till May or June. Violent storms are experienced in November, December, and January.

Directions. *—It is desirable to make the coast well to the southward of Cape Gavareah, and to round it as closely as possible, as the wind will, in all probability, veer to the northward on passing it. If the weather be clear, two mountains will be seen to the West and N.W. of the cape, and one far off to the northward and eastward. The eastern one of the two former, called *Villeuchinski*, is 7,372 ft. high, and peaked like a sugarloaf, and is in lat. $52^{\circ} 42'$, long. $158^{\circ} 22' E$. The highest and northernmost of the three is the *Mountain of Avatcha*, in lat. $53^{\circ} 21' N.$, long. $158^{\circ} 47' E.$; its height is 11,500 ft., and in clear weather it may be seen a very considerable distance. *Koselskoi Volcano*, the centre hill of the three, emits very little smoke.

These peaks are the best guide to Avatcha Bay, until near enough to distinguish the entrance, which will then appear to lie between high perpendicular cliffs. Upon the eastern one of these, the lighthouse bluff, there are a hut and signal-staff, and when any vessel is expected a light is sometimes shown. If the harbour be open, a large rock, called the *Baboushka*, will be seen on the western side of the channel, and three others, named the Brothers, on the eastern side, off the lighthouse. The channel lies in a N. by W. direction, true; and when the wind is fair, it may be sailed through by keeping in mid-channel; but it frequently happens that vessels have to beat in, and as the narrowness of the channel renders it necessary to stand as close to the dangers as possible, in order to lessen the number of tacks, it is requisite to attend strictly to the leading marks.

The outer dangers are a reef of rocks lying S.E., about $1\frac{1}{2}$ or 2 miles from the lighthouse bluff, and a reef lying off a bank which connects the two capes opposite, i.e. *Staniski Point*, with the cape to the southward. To avoid the lighthouse reef, do not shut in the land to the northward of the lighthouse bluff, unless certain of being at least $2\frac{1}{2}$ miles off shore, and when within

* These directions are by Admiral Beechey, as given in the Appendix to the Voyage of the *Blossom*.

three-quarters of a mile only. tack when the lighthouse bluff bears North, or N. $\frac{1}{2}$ E. Brothers Rock, in one with the lighthouse, leads close upon the edge of the reef. At night, if the light be visible, keep it in sight bearing N.W. There is anchorage with the lighthouse bearing N.E.

The first danger on the western shore has a rock above water upon it, and may be avoided by not opening the Baboushka with the cape beyond, with a flagstaff upon it, or by keeping Staniski Point well open with the said South signal bluff. In standing towards this rock, take care that the ebb tide in particular does not set you upon it. A good working mark for all this western shore is the Baboushka open with *Direction Bluff*, the last cape or hill on the *left upon the low land*, at the head of Avatcha Bay; but there is a $3\frac{1}{2}$ -fathoms patch lying just East of this mark, abreast the North part of the cliffs round Staniski Point. The bay South of Staniski Point is filled with rocks and foul ground.

The lighthouse reef is connected with the Brothers, and the cape must not be approached in any part within half a mile, nor the Brothers within a full cable's length. There are no good marks for the exact limit of this reef off the Brothers, and consequently ships must estimate that short distance. They must also here, and once for all, in beating through this channel, allow for shooting in stays, and for the tides which, ebb and flood, sweep over toward these rocks, running S.E. and N.E. They should also keep good way on the vessel, as the eddy currents may otherwise prevent her coming about.

To the northward of the Brothers, two-thirds of the way between them and a rugged cape, named *Pinnacle Point*, at the South extreme of a large sandy bay (Ismenai Bay), there are some rocks nearly awash; and off Pinnacle Point, which lies N.N.W. $1\frac{1}{2}$ mile from the lighthouse, there is a small reef, one of the outer rocks of which dries at half-tide. These dangers can almost always be seen; their outer edges lie nearly in a line, and they may be approached within a cable's length. If they are not seen, do not shut in the Rakovya or North signal bluff. Off Pinnacle Point the lead finds deeper water than in mid-channel, and very irregular soundings.

When northward of Staniski Point the Baboushka may be opened to the eastward a little with the South signal bluff North of it, but be careful of a shoal which extends about 3 cables South of the Baboushka. The Baboushka has no danger to the eastward, at a greater distance than a cable's length; and when it is passed there is nothing to fear on the western shore, until N.N.W. of the signal-staff, off which there is a long shoal, with only 2 and $2\frac{1}{2}$ fathoms. The water shoals gradually towards it, and the helm may safely be put down in $4\frac{1}{2}$ fathoms; but a certain guide is, not to open the western tangent of Baboushka with Staniski Point South of it. There is no other danger on this side of the entrance.

When a cable's length North of Pinnacle Reef, you may stretch into *Ismenai Bay*, guided by the soundings, which are regular, taking care of a 3-fathoms

knoll which lies half-way between Pinnacle Point and the second cliff, 7 cables northward of it. This bay affords good anchorage, and it may be convenient to anchor there for a tide. There is no other danger than the above-mentioned knoll. *Ismenai Rock*, the large square rock at the northern part of this bay, may be passed at a cable distance. This rock is connected with the land to the northward by a reef, and in standing back towards it, Pinnacle Point must be kept open of the lighthouse bluff; when in one, there is but $3\frac{1}{2}$ fathoms. Rakovya or North bluff signal-staff to the northward, in one with the bluff South of it (which had a large green bush overhanging its brow), will place you in 5 fathoms, close to the rocks.

Off the North bluff of Ismenai Bay there extends a small reef to a full cable's length from the shore; until this is passed, do not shut in Pinnacle Point with the lighthouse bluff. But to the northward of it you may tack within a cable's length of the bluffs, extending that distance a little off the signal-staff bluff, in consequence of some rocks which lie off them.

Northward of Rakovya signal-staff the only danger is *Rakovya Shoal*, three-quarters of a mile long E.S.E. and W.N.W., and 3 cables wide, with a depth of 6 ft. on its shallowest part, lying in the middle of the entrance to Rakovya Harbour. Upon its West part there is a buoy in summer, and to clear this keep the Brothers in sight.

There is no good mark for determining when you are to the northward of this shoal, and as the tides in their course up Rakovya Harbour are apt to set you towards it, it is better to keep the Brothers open until you are certain, by your distance, of having passed it (its northern edge is seven-eighths of a mile from Rakovya bluff), particularly as you may now stretch to the westward as far as you please, and as there is nothing to obstruct your beat up to the anchorage. The ground is everywhere good, and a person may select his own berth.

Rakovya Harbour, on the eastern side of Avatcha Bay, will afford good security to a vessel running in from sea with a southerly gale, at which time she might find difficulty in bringing up at the usual anchorage. In this case, Rakovya Shoal must be rounded, and left to the northward; 5 and $5\frac{1}{2}$ fathoms will be found close upon the edge of it, but the water should not be shoaled under 9 fathoms.

The little Harbour of Petropaulski is a convenient place for a refit of any kind. In entering, it is only necessary to guard against a near approach to the signal-staff on the peninsula on the West. The sandy point may be passed at a few yards' distance.

Weighing from the anchorage, off the peninsula flagstaff, with light winds, and with the beginning of the ebb, it is necessary to guard against being swept down upon Rakovya Shoal, and, when past it, upon the signal bluff on the same side. There are strong eddies all over this bay, and when the winds are light, ships often become unmanageable. It is better to weigh with the last drain of the flood.

Treinski Harbour, at the S.W. angle of Avutcha Bay, is an excellent port, but it is not frequented. It has no dangers, and may be safely entered.

It is high water at Petropaulski, on full and change, at 3^h 30^m; the tide rises 6 feet 7 inches at spring tides, and 4½ feet at neaps.

The old church at Petropaulski is in lat. 53° 1' 0" N., long. 158° 43' 30" E., according to Capt. Beechey, but later authorities place it in long. 158° 39' 15".

PETROPAULSKI stands in an amphitheatre on the slopes of two hills, which form the valley, and is simply composed of a group of small wooden houses, covered with reeds or dry grass, and surrounded by courts and gardens, with palisades. It was founded in 1790 by Ivan Jelagin, Behring's pilot, and named after the two vessels of the expedition. At its lower part, in the bottom of the valley, is the old church, remarkable for its fantastic construction, but fast falling into ruins. A new church has been built by an American Fur Trading Company, and at the back of it are the Company's premises.

In approaching *Point Shakoff*, as the extremity of the peninsula forming the harbour was named, and on which is a battery, perhaps a white buoy will be seen, marking the extremity of a bank having 3 fathoms on it, extending nearly a quarter of a mile S.S.E. (*true*) from it; two prominent white monuments in the cemetery in line lead clear of it. This may be passed close to,* leaving it to the left, and thence steer to the end of a low point of land which projects at an angle of about 45° from the direction of the coast, and nearly closes the bottom of the bay, making it into an excellent natural harbour, the best that can be desired. This tongue of land, like an artificial causeway, is but little above the surface of the water, and is now covered with *balagans*, huts raised on piles above the ground, serving to dry fish. In the early days of the Russian occupation it was the site of the colony. Arrived at the bottom of the port you land on a plank, which holds the place of a mole.

Mr. Whympere, who was here in 1865 and 1866, says:—With the exception of a few decent houses, the residences of the Russian officials and foreign merchants, the town makes no great shew. The poorer dwellings are very rough indeed, and are almost exclusively rude log cabins. The only noticeable building is the old Greek church, which has painted red and green roofs, and a belfry entirely detached from the building. Petropaulski was once a military post, and had a rather larger population than at present. The Cossack soldiers have now been removed to the Amoor.

The Russian-American Company had at one period stations in Petropaulski, and other parts of Kamchatka, but abandoned them, owing doubtless to the competition of private traders. It is now one of the centres of the fur trade,

* Keeping the South end of the cliff under the cemetery bearing N.E., until within a cable's length of the beach, when the church will appear in the centre of the valley, leads southward of this shoal, after which the direct channel to the inner harbour has nothing less than 6 fathoms.—*F. G. Roberts, Master, R.N., H.M.S. "President," 1856.*

but Nijni (new) Kamchatka is the present capital. Bolcheretsk was considered the principal town formerly, but has dwindled down to an inconsiderable village, and indeed the population, and with it the production of Kamchatka, is on the decline. Yet the climate is by no means so bad as commonly believed. Colonel Bulkley, of the Telegraph Expedition, considered that it was better than that of some of the New England States and Canada, and was quite certain that agriculture was possible.

A vessel in need of repair will only find safe anchorage in Avatcha Bay, and must depend on her own resources both for provisions, workmen, and refitments for the ship. It is, however, possible to procure, in urgent cases, some slight aid from the Government stores, and some workmen of the port; but these assistances, besides being limited, are very precarious. Wood is difficult to get, but water is easily obtained. A supply of fresh beef may be procured, and a little fresh butter, but it is difficult to get poultry or eggs. There are no sheep or pigs. Fish is abundant in the bay in the season; it begins with cod and is followed by salmon and salmon-trout.

The Coast.—The eastern coast of Kamchatka, between Cape Gavareah and Cape Lopatka, is very little known; it trends to the S.W. $\frac{1}{2}$ S., the shores in many places being lined with rocks. From the entrance of Avatcha Bay the coast trends nearly due South for 33 miles to *Cape Povorotni*, northward of which are *Listvenich* and *Akhomten Bays*, where anchorage may be had with fair shelter from westerly winds. From Cape Povorotni the coast trends S.S.W., 24 miles, to a high headland named *Cape Piratkoff*, and between them are *Mutnaia* and *Asatcha Bays*. Southward of this the land is not so high and broken as to the northward. The coast is steep and bold, and full of white chalky patches. The hills break abruptly, and form chasms and deep valleys, which are well wooded.

At 14 miles S.W. of Cape Piratkoff is *Cape Khadutka*, forming the North point of a large bay. The South extreme terminates in a conspicuous steep reddish bluff. *Cape Jelti*, about 20 miles S.W. of Cape Khadutka, is from 300 to 400 ft. high, with precipitous red cliffs. Anchorage may be obtained on its South side, protected by a reef to the East and an island to the southward. From hence to Cape Lopatka the distance is about 60 miles.*

CAPE LOPATKA, the South extremity of Kamchatka, is in lat. $50^{\circ} 52\frac{1}{2}'$ N., long. $156^{\circ} 45'$. It is a very low, flat, sandy cape, sloping gradually from the high level land to the North, and to the N.W. of it is a remarkably high moun-

* It was on this part of the coast that the singular occurrence of the wreck of a Japanese vessel occurred in July, 1729. In a former page (301) we have spoken of such an event having occurred on the coast of Oregon, and another will be mentioned at the Sandwich Islands. All these facts, which doubtless might be multiplied, would tend to prove that the winds and currents in the western portion of the North Pacific have a great analogy to those of the North Atlantic; the same progress of the cyclones, or revolving storms, and

tain. Its name, Lopatka, signifies the bladebone of a man, or a shovel, and is expressive of its form. It extends from the South end of the peninsula 10 or 15 miles, and is about half a mile broad. A small islet lies to the S.E. of it, eastward of which breakers were seen at a mile off shore. On the West side of the cape extensive reefs project about 7 miles to the N.W.

Kuril Strait, the passage between this cape and Shumshu, the N.W. Kurile Island, is about 8 miles broad, and very dangerous, on account of the strong currents and the sunken rocks on either side, which narrow it to a width of 3 miles. The depth in this strait is 10 to 20 fathoms, and from its East end a W.N.W. course leads safely through.

KURILE ISLANDS.

This extensive chain of islands extends nearly in a uniform S.W. line from the South extremity of Kamchatka to the North point of the Island of Yezo, a distance of about 650 miles.

Boussole Channel separates the chain into two portions; that to the northward was formerly claimed by Russia; but in 1875 the northern portion was ceded by Russia to Japan, in exchange for the Japanese possessions in Saghalin Island, so that the entire archipelago now belongs to Japan.

The northern portion is all apparently of volcanic origin; indeed the whole chain may be looked upon as a series of submerged mountains, a continuation of the mountain chain traversing Kamchatka through its whole length.

Of the southern portion the most considerable islands are Urup, Iturup, Kunashire, and Tschikotan or Spanberg Island. On these there are military posts for defence, and establishments for facilitating the commerce with the Aïnos, the native inhabitants. The name Kurile is derived from the Kamtchadale word for "smoke," the volcanic islands having been seen from Lopatka. The islands are all surrounded by fields of sea-weed.

Our acquaintance with the configuration of the Kurile Islands may be considered as tolerably complete. This result was one of the most difficult problems in hydrography. The fog in which the group is constantly enveloped; the violent currents experienced in all the passages or straits separating them; the steepness of their coasts, and the impossibility to anchor near the land, are such formidable obstacles, that it tries to the utmost the patience and perseverance of the mariner to acquire any knowledge respecting them. We are much indebted to a Russian Commander, Capt. Golownin, or Golovnine, who, in 1811,

the same drift to the N.E. on its West side. The vessel in question was bound from Satauma for another Japanese port called Osaka. She was driven from her course by a violent storm to sea, where they remained for six months, and at last reached this coast and cast anchor. The crew, seventeen in number, landed and encamped, but they were all shot but two by a treacherous Cosack, who was afterwards hung. The two survivors were sent to St. Petersburg to be educated.

was charged with the survey in the *Diana*; this was completed with the exception of the North sides of Kunasiri and Iturup. Besides this, we have the observations of Admiral Krusenstern in the *Naditjeda*, in 1805; of La Pérouse and Broughton, before alluded to; of Langman, Spanberg, and other Russian officers; and also a chart by the surveyor Gilaeff, made in 1790. In the Geological Magazine, 1879, pp. 337—348, is an article by Professor J. Milne, F.G.S., entitled, "A Cruise among the Volcanos of the Kurile Islands."

Alaid, the northernmost of the Kurile Islands, is small, about 6 miles in diameter, and in lat. $50^{\circ} 54' N.$, long. $155^{\circ} 32' E.$ It lies rather within or to the West of the general line of the archipelago. Professor Milne says its general appearance is that of a solitary cone, appearing to be over 3,000 ft. in height. In many places the shore line is bounded by low cliffs, terminating in a small abrupt peak at the S.W. end.

SHUMSHU or *Pervi Island* would, therefore, be reckoned as the first island in reckoning from Kamohatka, Alaid not properly forming part of this group. Its southern extreme terminates in a tongue of low land; the North end is the same, and is 8 miles distant from Cape Lopatka, in a S.W. $\frac{1}{2}$ W. direction, and has a reef extending 2 miles off it. The island is about 15 miles long in a N.E. and S.W. direction, and its centre lies in lat. $50^{\circ} 46'$, long. $156^{\circ} 26' E.$

Professor Milne states that, as compared with the other islands in this group, Shumushi is extremely flat. At *Myrup* (at the East end of the island) were three wooden houses, built by the Russians, all deserted. The inhabitants, 23 in number, live at a place called *Selene*, about 4 miles distant.

POROMUSHIR ISLAND, or *Paramushir*, is among the largest of the archipelago, being 68 miles in length N.E. and S.W. Its southern part is very mountainous, the S.W. portion less so. There is also a high mountain, named *Fuss Peak*, in lat. $50^{\circ} 15'$, long. $155^{\circ} 24' 15''$. Near its South end is a high and conspicuous dark peak, and to the southward of this are three remarkable peaks. The S.E. point is long and low, and a reef appears to extend off it.

A mountain, forming the northern end, is giving off steam, and is remarkable as being one of the flickering embers of those internal fiery forces, which raised the Kuriles; I have ventured to name it *Mount Ebeko*.—*Professor Milne*.

Little Kurile Strait separates Sumshu and Poromushir Islands. In its narrowest part it is only about a mile wide, near the village on the former island. In its southern entrance are a group of bare rocks, *Bird Islands*, with a deep channel between them and Koksar Rock, on the edge of the shoal extending southward of Sumshu. The flood stream sets through from the southward.

Shirinky Island, which lies about 9 miles off the S.W. extremity of Poromushir, according to Krusenstern's chart, and on which point is marked a peak, probably a volcano, is small, being not more than 2 miles in diameter. It lies in lat. $50^{\circ} 15' N.$, long. $154^{\circ} 58' E.$, and has apparently a flat top.

Monkonrushy Island, or *Makanrushi*, is considerably larger than the last, and when seen from the East shows as a fine cone. It lies in lat. $49^{\circ} 51' N.$, long. $154^{\circ} 32' E.$

Avos Rock.—Lieut. Khvostoff discovered, in June, 1806, a rock lying 7 miles S.W. of Monkonrushy, to which he gave the name of Avos, because, in first seeing it, he thought it was his consort, so named. This rock is surrounded by a dangerous reef, formed of rocks even with the water's edge.

ONNEKOTAN ISLAND is 24 miles long N.N.E. and S.S.W. Admiral Krusenstern having sailed along its western shores at a short distance, it was distinctly seen, which was not the case with its eastern face, which was passed a long way off. It has several lofty peaks, two of which are dome-shaped. The S.W. point, then named *Cape Krenitzon*, lies in lat. $49^{\circ} 19' N.$, long. $154^{\circ} 44' E.$; and its S.E. extreme at about 2 miles still farther to the South.

Amphitrite Strait, separating this island from Poromushir, is 22 miles broad, and is very safe; all ships going from Okhotsk to Kamchatka, or to the American coast, and returning, use this channel in preference.

KHARIM-KOTAN or *Kharamukotan* Island lies S.W. $\frac{1}{2}$ S. 8 miles from Onnekotan, and is about 7 miles in diameter; a peak rising in its centre lies in lat. $49^{\circ} 8' N.$, long. $154^{\circ} 39' E.$

Although *Shestoi Strait*, separating Onnekotan and Kharim-kotan, is safe, the currents in it are so violent, that with light winds, or if overtaken by a calm, the passage would become dangerous to a sailing vessel.

SHIASHKOTAN ISLAND lies 20 miles S.W. $\frac{1}{2}$ W. from Kharamukotan, and is 12 miles long in a N.N.E. and S.S.W. direction. Its centre is in lat. $48^{\circ} 52' N.$, long. $154^{\circ} 8' E.$ Near the South end is a truncated cone, and near the centre a similar cone, still higher, and yet active. *Ekarma Island*, 5 miles N.W. by W. of its N.W. point, stands up as a high irregular cone.

Chirin-kotan or *Tshirinkotan Island* is small, and scarcely more than 7 miles in circuit. It lies 24 miles from the N.W. point of Shiashkotan, in lat. $49^{\circ} 1' N.$, long. $153^{\circ} 30' E.$, and shows two tall hills.

Musir Islands, or *The Snares*.—On August 30, 1805, Krusenstern discovered four small islets, or rather rocks, one of which was awash. He named them the Snares, on account of the danger he was in from the currents he risked so unexpectedly. The strong currents around these rocks will always cause great embarrassment to every ship that passes near them. They lie 13 miles S.W. $\frac{1}{2}$ W. from Shiashkotan, in lat. $48^{\circ} 36' N.$, long. $153^{\circ} 44' E.$

Raikoke or *Raukoko* Island is small but hilly, and has a high peak, lying in lat. $48^{\circ} 17' N.$, long. $153^{\circ} 15' E.$

Matana Island lies 5 miles S.S.W. of Raukoko, the channel separating them being named *Golownin Strait*. Matana Island is 7 miles in length, North and South. *Sarytscheff Peak*, a lofty peak standing near its centre, is situated in lat. $48^{\circ} 6' N.$, long. $153^{\circ} 11' E.$

Rashau Island, in lat. $47^{\circ} 51' N.$, long. $152^{\circ} 48' E.$, is about 15 miles in

circumference, and lies 19 miles S.W. of Matsua Island. Krusenstern named the strait which separates them *Nadigjeda Strait*, because his vessel was the first which passed it, in 1805. This channel is very safe, but the currents in it are violent, and a sailing vessel should not attempt to take it unless the wind blows right through.

At this part terminate the observations of Admiral Krusenstern, and those of Capt. Golownin commence.

Ushishir Island succeeds to Rashau, and is composed of two islands, connected by a reef of 400 yards in length; each of these two small islands is about $1\frac{1}{2}$ mile in length, N.N.E. and S.S.W. A reef of rocks, terminated by a small islet named *Srednoy*, extends from the northernmost of these islands towards Rashau. This islet lies 6 miles to the S.W. by S. from the southern extremity of Rashau, and N.N.E. 4 miles from the northernmost part of Ushishir Island. Its extent, East and West, is 1 mile. The southern point of Ushishir is in lat. $47^{\circ} 35' N.$, long. $152^{\circ} 37' E.$, and the channel which separates it from Ketoy Island is very safe.

Ketoy Island, $12\frac{1}{2}$ miles S.W. by S. from Ushishir, is high and mountainous, and about 8 miles in circumference. Its South extremity lies in lat. $47^{\circ} 19' N.$, long. $152^{\circ} 22' E.$ Some rocks and islets extend for a considerable distance off its N.E. and East sides. On Russian charts it is placed 9 miles westward of the position assigned to it on British charts.

SIMUSIR ISLAND, about 15 miles to the W.S.W. of Ketoy, is 27 miles in extent N.E. and S.W., and 5 miles in breadth. In the northern part of it there is a bay, which was also seen by Capt. Broughton, after whom it is named; although it is very spacious, this port is only navigable for small vessels, on account of a reef lying in the middle of its entrance. At high water there is only 12 to 15 ft., and at low water 6 ft. depth in it. Rising behind Broughton Harbour are three conspicuous peaks, the central one estimated to be 2,100 ft. high. The lofty peak named by La Pérouse *Prevost Peak* is situated about 10 miles to S.W. from the N.E. point of the island, and lies in lat. $47^{\circ} 8' N.$, long. $151^{\circ} 52' 50'' E.$ At the southern extremity of the island, named by La Pérouse *Cape Rollin*, there is a high mountain, in lat. $46^{\circ} 51' N.$, long. $151^{\circ} 37' E.$ The land between this and Prevost Peak is comparatively low. The strait separating the Islands of Ketoy and Simusir has the name of *Diana Strait*.

Boussole Channel, nearly 60 miles in width between Simusir and Urup Islands, is believed to be free from danger. On its southern side are *Broughton*, *Rebuntsiriboi*, and *Brat Chirnoef Islands*. The northernmost, Broughton or Makanruru Island (Round Island of Broughton), is of good height, bold, and abrupt, sloping a little to the southward, near which end are some rocks, and apparently the only place where a landing could be effected.

The two other islands, Rebuntsiriboi or Chirnoi, and Brat Chirnoef or Chirnoi Brothers, lie N.N.E. and S.S.W., $1\frac{1}{2}$ mile apart. Rebuntsiriboi, the northernmost of the two, is remarkable from its having two conspicuous peaks of sugar-

leaf form. A reef, which much resembles an artificial breakwater, extends a mile East from its North point, and at its extremity there is a high rock.

URUP ISLAND, the next island to the S.W., was named by the Dutch *Company Island*. The N.W. point is hilly, as is all the island, which is covered with mountains, many of which are very high. It is 56 miles in extent, N.E. and S.W., and its greatest breadth is about 15 miles. Near its centre is a remarkable peak, in shape like a haystack, which can be seen in clear weather at 50 miles, and is often visible when the other portion of the island is obscured by fog. The N.W. side of the island is mostly rugged and steep, with no sign of anchorage or shelter.

The N.E. point of the island, named by La Pérouse *Cape Castricum*, lies in lat. $46^{\circ} 18' N.$, long. $150^{\circ} 28' E.$, and off it a chain of rocks extends for a distance of 5 miles, in an E.N.E. direction, and northward of it, at the distance of a mile from the shore, there is a large rock of a pyramidal form, with two others smaller; the first is sufficiently high to be seen in clear weather at 20 miles distance. The southernmost point, named by the Dutch *Cape Van der Lind*, is in lat. $45^{\circ} 37' N.$, long. $149^{\circ} 34' E.$ The S.W. point of the island is low and steep, and continues so for about 15 miles in a northerly direction, when it rises to a lofty mountain range; a high and almost perpendicular rock, appearing like a sail when seen at a distance, lies S.E. about 1 mile from the point.

Port Tavano is a small harbour on the eastern side of Urup, but it is open to the eastward, and with the wind from that quarter a heavy swell rolls in, which, with the shallow water and rocks it contains, do not recommend it as a safe anchorage. The entrance has 8 and 10 fathoms water, and is 120 yards across; nearly in the centre of the port there are some rocks just above water, with $4\frac{1}{2}$ and 5 fathoms close-to. Water is procured from two rivers at the head of the harbour. Salmon and rock fish are plentiful.

The only good mark for Port Tavano is a small, high, rocky islet, lying a quarter of a mile S.E. by E. from the South point of the bay. After passing this the harbour will open, bearing about West, and when the islet bears South the depth will be 27 fathoms, sand and mud, gradually shoaling as the harbour is approached.

About 113 miles S.E. by E. of this part of Urup, the U.S. surveying vessel *Tuscarora* obtained a sounding of 4,655 fathoms, the greatest depth yet found in any part of the world.

ITURUP, *Yeterop*, or *Staaten Island*, is little known. It is separated from Urup by the *Strait of De Vries* or *Yetorup*, discovered in 1643, about 30 miles wide, and free from danger. The N.E. point of the island, *Cape Okebets*, is high and perpendicular, and is also remarkable by three paps; it lies in about lat. $45^{\circ} 36' N.$, long. $148^{\circ} 49' E.$ Professor Milne says that it contains several large blocks of mountains, separated by intervening spaces of lower ground. The South point of Iturup, *Cape Tesiko*, but which Krusenstern

names *Cape Rikord*, lies in lat. $44^{\circ} 26' N.$, long. $146^{\circ} 58' E.$ The island is therefore 114 miles in extent from N.E. $\frac{1}{2}$ E. to S.W. $\frac{1}{2}$ W. Its greatest breadth is about 22 miles. Capt. Golownin only examined the southern part of the island; the N.W. cape was named by La Pérouse *Cape De Vries*. The Japanese had two establishments, *Sana* and *Urbitch*, on the S.W. part of Iturup, and there are several small settlements on its N.W. side, the natives being about 700 in number.

H.M.S. *Cormorant* entered a deep bay on the East side of the island, between Capes Nonciso and Tosimoinots; here there is shelter from all but southerly winds. This is probably the same as *Onnebitsou Bay*, the entrance of which is in about lat. $44^{\circ} 52' N.$ It appears to have a depth of 7 or 8 miles, its entrance being about 4 miles wide. The French frigate *Volta* anchored here in August, 1875, about a mile from the land, in about 8 fathoms, opposite two or three Japanese houses near a stream. Fish was abundant.

Skotan, *Tschikotan*, *Sikolan*, or *Spanberg Island*.—About 29 miles to the S. by W. of the S.W. point of Iturup is Skotan Island, which is called by Capt. Broughton Spanberg Island. It is called in Cook's voyage *Nadergada*. It is a desolate island, about 12 miles in diameter, rising to a height of nearly 1,500 ft. near its S.W. side. Its centre is in lat. $43^{\circ} 50' N.$, long. $146^{\circ} 49' E.$ Its northern and eastern sides appear to be indented by several deep bays or inlets. The space between Skotan and Cape Noyshaf, the N.E. point of Yezo, is much contracted by islands, rocks, and reefs, named *Walvis Islands* by De Vries; the only safe channel is between Skotan and the northern island.

KUNASIRI, or *Kunashire Island*, the last of the Kuriles, is separated from Iturup by *Pico* or *Kunasiri Channel*, which is about 14 miles wide, and was first traversed, in 1643, by Capt. Vries; next by Capt. Loffzoff, in the Russian ship *St. Catherine*, in 1793; Capt. Broughton, in 1797; and Capt. Golownin, in 1813, also successfully passed through this strait. Lieut. Neville, H.M.S. *Cormorant*, reports that he observed a line of heavy breakers extending right across this channel, the sea breaking perpendicularly 20 to 25 ft. high.

Kunasiri Island is about 66 miles in length N.E. $\frac{1}{2}$ E. and S.W. $\frac{1}{2}$ W., and is high, *St. Anthony* or *Tschatchanobury Peak*, near the N.E. end, being 7,400 ft. high, and showing two distinct cones, rising one above the other. The island is stated to be surrounded with rocks and dangers. Krusenstern named the N.E. point *Cape Loffzoff*.

The S.W. part of Kunashire forms *Itmen Bay*, named by the officers of the *Diana* the *Bay of Traitors*, because it was here that the Japanese, after inviting Captain Golownin to land, seized him and made him prisoner. The two points forming the bay lie in a N.W. $\frac{1}{2}$ W. and S.E. $\frac{1}{2}$ E. direction, 6 miles apart. The western point is a tongue of sand almost awash, with shallow water off it, appearing to run to the S.W. across to the Yezo shore. The bay has a depth of $3\frac{1}{2}$ fathoms, and at its head is the village of *Tomari*, the inhabitants living on fish. The village is in about lat. $43^{\circ} 44' N.$, long. $145^{\circ} 33' E.$

The flood tide, which hardly rises beyond 4½ ft., comes from the East, and directs itself along the coast, and turns around the S.W. point towards the strait which separates Kunashire from Yezo, and called the *Strait of Yezo*. This will be described hereafter.

THE SEA OF OKHOTSK.

The Sea of Okhotsk, surrounded as it is on all its northern and western sides by the continent, and to the S.E. by the range of the Kurile Archipelago, may be considered as completely landlocked. In this respect, as well as in size and general situation, it is not unlike Hudson's Bay.

The coast to the S.W. of Okhotsk was surveyed, but not verbally described, by Sarytsheff and Tomine; and of the Shantar Islands, and the great Island or Peninsula of Saghalin, we have the details given by Broughton and Krusenstern. In addition to these we have some details in the Russian charts of 1849—51, but nothing satisfactory.

We have few particulars respecting the open sea, its currents, or its soundings; but it is known to resemble the Sea of Pehring in its shallowness, though it is somewhat deeper. The shores are closely surrounded by mountains, which occasions all the rivers, with one exception, to be insignificant in their magnitude.

The only river falling into this vast basin is the Amur, if indeed the Amur can fairly be said to do so, terminating as it does in a bay, which, being bounded in front by Saghalin Island, opens by one strait into the Sea of Okhotsk, and by another into the Gulf of Tartary.

One feature of interest in this remote expanse of waters is the field it offers for the whale fishery. Whales have at times been found to be very numerous, and of late years the hardy American whalers have here pursued successfully their gigantic game.

Whaling vessels frequent this sea from the beginning of July to the beginning of October, few, if any, being in it by the 10th of October. The shores are covered with ice from November to April, but the main expanse continues open throughout the year, and, being generally deep without any apparent danger, its navigation is safe, notwithstanding the fogs and storms with which it is often visited.

In former years, as before stated, the whaling fleet interfered very greatly, by their trading, with the privileges of the Russian-American Company, a fact which formed one great inducement for the Russian Government to transfer the Territory of Alaska to the United States. Since that transfer, the Governor-General of Eastern Siberia has declared that the Sea of Okhotsk shall be considered as a closed sea, and that vessels which enter it for the whale fishery shall pay a duty equal to 10 roubles per annum. The number of vessels hitherto so engaged here has varied from 200 to 500. Permission is also

necessary for foreign vessels wishing to trade, &c., on the Russian coasts and islands of the Behring Sea, and should be obtained at Vladivostok.

Care must be exercised in approaching the shores, as in many parts their longitude on the chart may be erroneous. Northward of the Gulf of Amur navigation during the summer months in unsurveyed waters is less dangerous than would at first appear, as in case of fog anchorage may commonly be found when near the land.

CAPE LOPATKA, the South extremity of Kamchatka, has been described on page 736.

The Western Coast of Kamchatka is uniformly low and sandy, for about 25 to 30 miles inland, when the mountains commence. It produces only willow, alder, and mountain ash, with some scattered patches of stunted birch trees. The runs of water into the sea from the mountains do not, with the exception of the *Bolshaya* or *Bolchoireka*, deserve the name of rivers, though they are all well stocked with fish from the sea in the season, as trout, and different species of salmon. They are generally at the distance of 15 to 20 miles from each other. The *Itsha* and the *Tigil* are the next most considerable; and neither of them have a course, with all the windings, of more than 100 miles.

Off the western coast of Kamchatka the sea is shallow to a considerable distance; and the commanders of transport vessels, who never lose sight of the exposed coast if they can help it, judge of their distance from the land, in foggy weather, by the soundings, allowing a fathom for a mile; nor is there at the entrance into any of the rivers more than 6 ft. at low water, with a considerable surf breaking on the sandy beach.

Bolcheretsk is the place that is best known to Europeans on the West coast, though its present insignificance scarcely deserves notice. It was the seat of the government of Kamchatka previous to its removal to Petropaulski. Of course this abstraction has diminished its little importance, and it is therefore seldom or never visited now by commercial vessels. The expeditions under Captains Cook and Clerke visited it overland from Avatcha Bay. Capt. King's description of it is as follows:—"Bolcheretsk is situated in a low swampy plain, that extends to the Sea of Okhotsk, being about 40 miles long, and of a considerable breadth. It lies on the North side of the *Bolchoireka* (or great river). Below the town the river is from 6 to 8 ft. deep, and about a quarter of a mile broad. It empties itself into the Sea of Okhotsk, at the distance of 23 miles; where, according to Krachenninikoff, it is capable of admitting vessels of a considerable size."

The villages on this coast, beyond Bolcheretsk, are *Itshinak* and *Tigilsk*, situated on the *Itsha* and *Tigel* or *Tigil Rivers*. *Itshinsk*, lat. $55^{\circ} 55'$, contains a church, and about ten houses. Besides these, there are eight inconsiderable villages, containing each three or four houses, on the West coast.

At about lat. $57^{\circ} 8'$ is *Haryasoff Point*, northward of which is a group of

islands and rocks. At 20 miles S.W. of the point is *Moroshetchnos River*, and about 10 miles inland a volcano. Thence to the southward the land becomes low. *Cape Utkolokski*, about 50 miles north-eastward of Hargasoff Point, consists of high precipitous cliffs, its North point forming a peak with a bluff 400 ft. high. *Cape Omgon*, 16 miles farther on, has somewhat the same appearance. The tides hereabout follow the trend of the coast, the flood setting northward; at springs they run 3 or 4 knots, and form heavy races off the prominent headlands.

TIGEL RIVER, about 18 miles eastward of Cape Omgon, is a considerable stream, with a village just inside the bar. Beef, fish, and milk are plentiful; potatoes are also grown. About 30 miles up it is the Russian settlement *Fort Tigel*, called by the Russians a fortified town, built in 1752. Sauer says it contained forty-five wooden houses and a church. It is surrounded by wooden palisades, and is a place of some importance in Kamchatka, as the Koriak and Tehuktohi tribes gather round it in January, to exchange their furs for tea, coffee, powder, lead, &c.

Vessels drawing 14 ft. can cross the bar at high water, and moor off the village. There is good anchorage off the entrance in 6 fathoms, with Cape Omgon bearing W. by S., and the bar beacons in line S.E. by E. It is high water, on full and change, at 11^h; springs rise 22 ft. The tides run with great velocity, the flood to N.E.

GHIJINSK GULF, forming the N.E. portion of the Sea of Okhotsk, is but very little known in a nautical view. Its entrance lies between Cape Utkolokski, on Kamchatka, in lat. 57° 50' N., long. 157° 18' E., and *Cape Bligan*, in lat. 58° 40', long. 151° 35'. Within this line it extends about 150 miles in a N.E. direction, when it divides into two narrower gulfs, separated by the promontory terminating in *Cape Taigencoss*.

Penjinak Gulf, the eastern arm, extends as far North as lat. 62° 25', and its shores are quite unknown. *Pustaresk*, according to M. Lesseps, in 1788, in about lat. 61° 0' N., long. 162° 30' E., is a small village on the side of a hill, the foot of which is bathed by the sea. The river cannot be called such; it is merely a narrow inlet of the sea, reaching to the foot of the above mountain. *Kaminoi*, at the head of the gulf, is an *ostrog*, or village, about 300 versts distant from Pustaresk. It is on an elevation nearly on the sea shore, and at the mouth of the River Penjina, in lat. 62° 0' N., long. 162° 50' E.

The western gulf extends about 90 miles to the northward, shoaling gradually towards its head. From *Cape Telanski*, a bold headland, with an island off it, on the East side of its entrance, to Gighiga River, at its head, the coast consists of bold precipitous cliffs, with small indentations here and there. At 21 miles N. $\frac{1}{2}$ W. of Cape Telanski is *Cape Khalpih*, off which lie the cliffty *Morskaja Matuga Islands*, the one nearest the cape, about 250 ft. high, having a high tower-like bluff on its northern face. *Cape Varchalam*, 25 miles to the northward, should be approached with great caution, sunken rocks lying off it.

Ghigga River is navigable for vessels of light draught. At the entrance is a trading station, and 12 miles up the river is *Ghijega*, the Russian settlement. During the open season a *fixed bright light* is shown from a small light-house on the East bank of the entrance. It is high water, on full and change, at 3^h; springs rise 24 ft.

Ghijega, or *Fort Ghijinsk* or *Jijiginsk*, in lat. 62° 10', long. 160° 15', at the head of the gulf to which it gives its name, stands on the river of the same name, and from without appears as a square enclosure defended by a palisade, according to M. de Lesseps. The houses are all of wood, very low, and nearly all of a uniform elevation. The population were all members of, or attached to, the Russian service, and numbered 310 in 1881. The commerce is chiefly in furs, and that principally reindeer skins. Reindeer flesh and salmon can be procured here.

"The Ghijinsk of the charts is situated on the river of the same name, about 8 miles from the coast of the Ghijinsk Gulf. It is an insignificant village of 200 or 300 people, but it has more importance than its size would lead to the belief. It is the seat of the local government, and is a centre of trade with regard to the fur trade of the district. It is also the only place for several hundred miles around where the poor Russian settler, or the semi-civilized Kamtchatdale, can get any tea, sugar, or vodka (whiskey). The governor, or Ispranik, has only 25 Cossacks under him, and has no power to visit a hundredth part of his immense territory."—*Mr. Whymper*.

It was made one of the stations of the intended Western Union Telegraph route. Mr. Knox, who came here in the summer of 1866, in charge of this part of the expedition, does not describe it as a terrestrial paradise, the climate being very unhealthy.

The North Coast of the Sea of Okhotsk, from Ghijinsk Bay to Okhotsk, a distance of 400 miles westward, is almost unknown, and we can therefore give no description of it.

OKHOTSK was formerly the principal seaport, if it deserve such a name, of the sea to which it gives the appellation. It stands on the N.W. side of the sea, in lat. 59° 20' N., long. 143° 14' E.

The shallowness of the water a long way off from the entrance of the harbour, and the violence and cross set of the tides at the harbour's mouth, preclude the possibility of Okhotsk being an easily accessible port, except for a small vessel. The river, which is only accessible from June to September, has only 9 ft. water in its mouth.

Okhotsk was visited by Sir George Simpson in his overland journey. He arrived here from Sitka, June 27th, 1842. "Okhotsk, now that we had reached it, appeared to have little to recommend it to our favour, standing on a shingly beach so low and flat as not to be distinguished at our distance from the adjacent waters. We saw nothing but a number of wretched buildings, which seemed

North Pacific.

to be in the sea, just as much as ourselves; while, from their irregularity, they looked as if actually afloat; and even of this miserable prospect one of the characteristic fogs of this part of the world begrudged us fully one-half."

The tongue of land, about three-quarters of a mile in length, and one-quarter of a mile in width, is so little elevated above the level of the sea, that when the southerly wind blows hard or continues long, the whole is almost sure to be inundated. The town lies about half a mile distant, situated on the left bank of the Kuchtui.

A more dreary scene can scarcely be conceived. Not a tree, and hardly even a green blade, is to be seen within miles of the town, and a stagnant marsh in the midst of it must be, except when it is frozen, a nursery for all sorts of malaria. The soil is on a par with the climate. Summer consists of three months of damp and chilly weather, succeeded by nine months of dreary winter, as raw as it is intense. The principal food of the inhabitants is fish, which is also the staple food of the cattle and poultry. The Sea of Okhotsk yields as many as fourteen varieties of the salmon alone, one of them, the nerker, being the finest thing of the kind ever tasted. On such fare, and in such a climate, no people could be healthy. Scurvy, in particular, rages here every winter.

Okhotsk has declined since Nicolaiefski was established, the interest having been much drawn to the latter place. In 1881 there were about 200 inhabitants, existing by trading in furs and fish for the necessaries of life. There is communication with Europe once a month, via Irkutsk.

Bad as the Harbour of Okhotsk is, it is believed to be the best in the Sea of Okhotsk. The coast between Okhotsk and Fort Oudskoi has been surveyed by the Russian Vice-Admirals Sarytscheff and Tomine, so we may suppose them to be well represented on the charts.

For 30 miles south-westward of Okhotsk, or as far as Ulya, the coast is low, but from thence to Port Aian, a distance of 210 miles, the shore is composed of high cliffs, with mountainous peaks inland. *Aldoma Bay*, in lat. $56^{\circ} 50' N.$, is sheltered by Murki Peninsula, and good anchorage may be obtained here in 3 to 5 fathoms, only open to winds between S.S.W. and S.E. by E.

PORT AIAN or **Ayan**, on the western coast of the Sea of Okhotsk, may be recognized from the southward by *Cape Vneshni* or Outer Cape, a high barren promontory with several craggy peaks upon it, at a mile eastward of its eastern point of entrance, and in lat. $56^{\circ} 25' 28'' N.$, long. $138^{\circ} 21' E.$ The coast in the neighbourhood is high and bold, with whitish-coloured cliffs.

The inner part of the port is from one-quarter to half a mile wide, and three-quarters of a mile deep, and affords good shelter for small vessels, in 2 to 5 fathoms, muddy bottom, only exposed to winds between South and S.E. The outer part, with 8 to 12 fathoms over good holding ground, is exposed to S.W. and southerly winds, which send in a heavy sea. On the West side of the entrance is a reef of rocks, with 4 fathoms close-to, barely covered at high water; the eastern shore is steep, and may be closely approached. The little

settlement lies in a valley on the N.E. side of the bay. This locality is noted for the quality of its sables.

The climate here is abominable, and fogs are uninterrupted; the ice breaks up in June, and snow does not always disappear before August. The port is frozen over in November. It is high water, on full and change, at 12^h; springs rise about 10 ft.

Supplies are scarce in Port Aian, and difficult to be obtained, beef only being procurable, but fire-wood is plentiful. To the southward of the entrance is a sandy bay, in which the soundings appear to be regular, and where water may be conveniently procured, or it may be obtained from a small stream on the West side of the bay. Scurvy is common and fatal among the inhabitants, but the wild rhubarb, growing close to the sea in many parts of the harbour, is of great service as an anti-scorbutic.*

From Port Aian the coast, bold and steep-to, trends 135 miles to the S.W., to the head of Oudsky Bay. *North-east Harbour*, in lat. 55° 10', is said to afford anchorage.

JONAS or **St. Jona Island**, a collection of naked rocks, discovered by Capt. Billings in the Russian corvette *Slava Rossii*, lies off this portion of the coast. It is about 2 miles in circumference, and 1,200 ft. high, lying in lat. 56° 23' N., long. 143° 16' E. Except off its West side, this islet is entirely surrounded by detached rocks, against which the waves beat with great violence, and which extend a considerable distance below the surface of the water. With the island bearing North, distant 12 miles, Krusenstern had 12 fathoms water.

SHANTAR or **Shantaraki Islands**, in the western part of the Sea of Okhotsk, were surveyed by Lieut. Kosmin, who accompanied Capt. Wrangel in his Siberian expeditions. From that survey it appears that the principal of the group is *Great Shantar Island*, which is 35 miles long, in an East and West direction, and of an equal breadth from North to South. Notwithstanding this extent of coast, it does not appear to afford any port, but the S.W. point of the island projects to the S.W., so as to form an open bay to the eastward of it. Between this point and *Cape Nikla* and *Dougangen*, the nearest point of the continent, 14 miles distant, are two islets, *Barrier* and *Duck Islands*, surrounded by rocks and reefs; one of these rocks is 30 ft. high.

The North point of Great Shantar is in lat. 55° 11' N., long. 137° 40' E.; its South point is in lat. 54° 36'. To the South of it are some smaller islands,

* Ayan was visited by the allied squadron, and taken possession of on July 10th, 1855. Mr. J. M. Tronson, who was on board H.M.S. *Barracouta*, gives a description of the place, and their visit (pp. 123-132). He says, "As we entered the port we could not but admire the beautiful scenery of this calm retreat, notwithstanding our warlike mission. On each side of the port a prominent headland projects. Ayan was formerly a post of the Russian-American Company, but owing to the competition of the numerous whalers, who all traded with the natives, it had given up all business on the coast before the transfer of their interest to the United States."

and to the East of it are two islands, one in lat. $55^{\circ} 5'$, long. $138^{\circ} 22'$, called *Prokofeff*, the other, in lat. $54^{\circ} 43'$, long. $138^{\circ} 12'$, *Koassoff*. At 6 miles West of Great Shantar Island is *Feklistoff Island*, 20 miles in extent, from N.E. to S.W., its breadth being about one-half. This island has also no port or shelter, and off its West side lies *Sugarloaf Island*.

Southward of Shantar Islands the coast is indented by several deep inlets. *Oudsky Bay*, westward of the islands, has a convenient depth for anchorage, but appears to be very exposed. At its head is the mouth of the *River Ouda*, in lat. $54^{\circ} 41' N.$, long. $134^{\circ} 27' E.$, about 20 miles up which is *Fort Ouda* or *Oudskoi*, a considerable establishment, determined by Lieut. Kosmin, in 1829-1830, to be in lat. $54^{\circ} 29'$, long. $134^{\circ} 58'$.

From the mouth of the *River Ouda* the coast, for an extent of 50 miles, runs nearly in an East direction to a point behind which is a small bay named the *Bay of Swans*. The western point of this bay is *Cape Dougandsha*, and eastward of this, to the mouth of the *River Tugur*, the coast runs South, and forms, with a promontory lying to the eastward named *Cape Linekinskoy*, the *Bay of Tugursk*, the opening of which is about 12 miles wide, and the depth about 35 miles. The *River Tugur* falls into the head of the bay in lat. $53^{\circ} 45'$. *Tugursk Bay* and *River* were partially examined, in 1806, by an officer of the Russian Navy, *Borissoff*.

Eastward of *Tugursk Bay* is another extensive bay named *Oulbanski*; there is reported to be anchorage in *Akademie Gulf*, at its head, and also in *Constantine Bay* on its West shore. Separated from the East side of this bay by a peninsula is *St. Nicholas* or *Usalghin Bay*, of which little is known. We have no description of the coast eastward of this, to the northern entrance of the *Gulf of Amur*.

SAGHALIN ISLAND.

The name applied to this great island is derived from the Mantchus, who thus call it after their river, *Saghalin Ula*, the *Amur*, which falls into the sea opposite the N.W. coast of this island. Besides the term *Saghalin*, geographers have given it the names of *Oku-Jesso*, *Krafto* or *Karafuta*, *Tschoka*, and *Sandan*. It is called *Tarakai* by the natives, and *Karafuto* by the Japanese. It now belongs to the Russians, the Japanese having ceded their portion of the island, in 1875, in exchange for the Russian islands of the Kurile Archipelago.

The natives are comparatively very few in number; scarcely any signs whatever were seen on all the eastern side by Capt. Krusenstern, who closely examined this coast, and from the second volume of whose voyage some of the subsequent particulars are taken. They were principally found in the service of the Japanese in *Aniwa Bay*. They are called *Ainos*, as are the natives of the adjacent Island of *Yezo*, and are certainly the same people that, since *Spanberg's* time, have been called *Hairy Kuriles*. The *Ainos* are rather below

the middle stature; of a dark, nearly black, complexion, with a thick bushy beard, and black, rough, straight hair; except in the beard, they resemble the Kamchadales. The women are ugly, but modest in the highest degree. Their characteristic quality is goodness of heart, as is expressed in their countenance. Their dress consists chiefly of the skins of seals and dogs, of which latter they keep great abundance. They appeared to live in the most happy way in their domestic life. Capt. Krusenstern is inclined to doubt the ancient accounts of its inhabitants.

The total population is estimated to number about 14,000. The southern part of the island is inhabited by Ainos, about 2,000 in number, and the northern part by Ghiliaks (Tartars), the latter about 3,000 in number, good seamen and hunters. The Russians have about 3,000 troops here, mostly employed to guard the convicts working the coal mines. The principal occupation of the natives is hunting and fishing, the chief articles of exports being furs and fish.*

The Island of Saghalin extends in a North and South direction about 512 miles; its breadth, in general, does not exceed 70 miles; but near its central part it is nearly 100 miles in width. At its southern end it gradually tapers off to two sharp points, enclosing a large bay between them, named by the Dutch Aniwa Bay. The northern part, as well as the southern, terminates in a bay, which Capt. Krusenstern called North Bay. There is no port in the island which can be termed a safe place of refuge.

The island is mountainous, and to the North of lat. 50° the range forms in rocky peaks; to the southward of this the hills slope gradually to the coast. Two ranges extend respectively N.W. and N.E. from its southern extremes, meeting in Bernizet Peak in lat. $47^{\circ} 33' N$. *Mount Tiara*, 4,000 ft. high, stands out prominently on the East side of the island, in about lat. $50^{\circ} 5'$. There are no volcanos in Saghalin. The chief rivers are the *Tymy*, and the *Poronai* or *Ty*, only navigable by boats; the latter debouches into the head of Patience Bay, and the former on the East coast, in lat. $51^{\circ} 55' N$. M. Poliakov, who explored the island in 1881-2, states that the Tym is navigable for vessels of 16 ft. draught, for a distance of about 3 miles.

The western coast is steep and cliffy, the eastern is low and sandy. The middle district of the island is flat and swampy, but to the North it is hilly and fertile. It is well wooded throughout with firs of various sorts, birch, elm, &c., and large quantities of timber are exported to Japan for building purposes. The climate is cold and damp, so that little or no agriculture can be carried on.

There is coal in several parts of this island, and on its West side, around

* An interesting account of Saghalin will be found in the "Journal of the Royal Geographical Society," 1872, pp. 373-388, being a Paper by Colonel Veniukof, translated from the Russian by Capt. Spalding. See, also, "Saghalin from a Japanese source," in the "Geographical Magazine," August, 1878, pp. 205-208.

Jonquiére Bay and Dui, it rises to the surface, and is of fair quality. Gold, copper, and iron also exist here. Whales are found on the East and South coasts, salmon and herrings abound, and in the deep bay of Aniwa on the South, into which two large streams fall, the Japanese established an extensive salmon fishery. The largest fishing station is at the head of Patience Bay. Water is abundant at all parts, and drift-wood for fuel is found in large quantities along the western coast.

CAPE ELIZABETH, the North point of the island, is in lat. $54^{\circ} 24' 30''$ N., long. $142^{\circ} 47' E.$, and is a high mass of rock, forming the extremity of a continuous chain of mountains. It is very remarkable from a number of high pointed hills, or rather naked rocks, upon which neither tree nor verdure is visible. It descends gradually towards the sea, and at the brink of the precipice is a pinnacle or small peak. Seen from the West, it is exceedingly like Cape Lopatka, except that it is higher.

Cape Mary, 18 miles W.S.W. from Cape Elizabeth, is in lat. $54^{\circ} 17' 30''$, long. $142^{\circ} 17' 45'' E.$; it is lower than Cape Elizabeth, and consists of a chain of hills all nearly of the same elevation. It slopes gently down to the sea, and terminates in a steep precipice, from whence a dangerous reef runs to the N.E. It is high water here, on full and change, at 2^h ; the rise is about 5 ft.

North Bay (*Sévernaia Guba*), which lies between these two capes, is very open, but appeared to be safe, especially in summer, when North winds are rare. At $1\frac{1}{2}$ mile off shore the depth is 9 fathoms, sand, gradually decreasing to 3 fathoms, over excellent anchorage ground. There is a village at the head.

Sailing vessels should not approach Capes Elizabeth and Mary within 20 miles, to avoid the current; the winds are generally light and variable inshore. By standing over to the Tartary coast the current is weaker, and the depth of water moderate, affording safe anchorage in case of fog or calm.

Nadiejeda Bay, or *Nadeshda Bay*, about 10 miles to the S.E. of Cape Mary, on the West coast, is rather open, and consequently not safe for anchorage, as the ground everywhere is rocky. It lies in lat. $54^{\circ} 10' 15'' N.$, long. $142^{\circ} 27' 34'' E.$ A plentiful supply of wood and water may easily be procured here. The southern point of the bay was named *Cape Horner*, after Dr. Horner, the naturalist on board Krusenstern's ship the *Nadiejeda*. *Obman Bay*, 44 miles southward of Cape Mary, has barely sufficient water in its entrance for boats.

The N.W. coast of Saghalin is infinitely preferable to the S.W.; between the mountains, which are entirely overgrown with the thickest forests, are valleys which appear very capable of cultivation. The shores are broken, and are almost everywhere of a yellow colour, which gives the coast the appearance of being hemmed in by an artificial wall. The confines of the high and low lands are precisely in the same parallel as on the opposite side; and beyond the limits, to the S.S.W., as far as the eye could reach, nothing could be seen but the low sandy shore, with here and there a few insulated but picturesque sand-hills.

Cape Golovatcheff, in lat. $53^{\circ} 25' N.$, long. $141^{\circ} 55' E.$, forms with Cape Bombreg, on the coast of Tartary, the northern entrance into the Gulf of Amur.

As we shall hereafter allude to the Amur River and Gulf, we return again to the North point, and proceed to describe the eastern coast of the island.

CAPE LÖWENSTERN, in lat. $54^{\circ} 3' 15'' N.$, long. $143^{\circ} 15' E.$, was named after Krusenstern's third lieutenant. The appearance of the coast between this cape and Cape Elizabeth is very dreary: no traces of vegetation are apparent, and the whole coast is ironbound, consisting of one mass of black granite rock, with here and there a white spot; the depth at 3 miles off shore was 30 fathoms, rocky bottom. In front of Cape Löwenstern there is a large rock. Southward of it the shore is everywhere steep, and in several places consists of rocks of a chalk-like appearance.

Cape Klokatcheff is stated to be in lat. $53^{\circ} 46' N.$, long. $143^{\circ} 7' E.$, and near it appeared to be the mouth of a considerable river, as the land appeared to be unconnected. *Cape Wurst*, or *Virst*, is in lat. 53° , long. $143^{\circ} 30'$. A long way inland there are several considerable high lands, the coast being, as far as the eye can reach, composed of flat sand. *Shoal Point*, or *Cape Otmeloi*, in lat. $52^{\circ} 34'$, long. $143^{\circ} 27'$, may easily be known by a hill of tolerable height, which on this flat coast almost merits the name of a mountain, and forms a very remarkable object. At this point the coast recedes to the westward, and here a *dangerous shoal* lies. It is in lat. $52^{\circ} 30' N.$, and stretches probably for some miles North and South at a distance of 10 miles from the shore. This is the only one met with off the coast, and has $4\frac{1}{2}$ to 8 fathoms on its outer edge.

Downs Point, in lat. $51^{\circ} 53' N.$, is remarkable for a round hill. To the northward of it is a chain of five hills, of a billowy form, having the appearance of islands in this extended plain. The whole coast here, like that to the southward, is scarcely raised above the water's edge. Near here the *River Tymy* debouches.

Cape Delisle, named after the astronomer Delisle de la Croyère, is in lat. $51^{\circ} 0' 30''$, long. $143^{\circ} 43'$, and forms the boundary of the mountainous part of Saghalin, for to the northward of it there is neither high land nor a single mountain, the shore everywhere consisting of sand, of a most dangerous uniformity.

Cape Ratmanoff, in lat. $50^{\circ} 48' N.$, long. $143^{\circ} 55' E.$, terminates in a flat neck of land, stretching a considerable distance into the sea. The coast hereabouts is invariably craggy, and of a yellow colour. *Cape Rinnik* is in lat. $50^{\circ} 12' 30''$, long. $144^{\circ} 5' E.$, and at the back of it, some miles inland, is *Mount Tiara*, so named by Krusenstern from its form, a flat hill, 4,000 ft. high, remarkable for having three points on its summit. It is in lat. $50^{\circ} 3' N.$, long. $143^{\circ} 35' E.$ From its parallel the coast trends to S.S.E.

Cape Bellingshausen is in lat. $49^{\circ} 35' N.$, long. $144^{\circ} 25' 45'' E.$, and at 7 miles S.S.W. of it is a point which was thought to offer a good harbour. The

shore is very abrupt, and entirely white. *Flat Bay*, in lat. $49^{\circ} 5'$, is surrounded on all sides by very low country. It is a deep opening, in which even from the mast-head no land could be descried.

Cape Patience, the most prominent and the easternmost cape of Saghalin, is in lat. $48^{\circ} 52' N.$, long. $144^{\circ} 46' 15'' E.$, and is a very low promontory, formed by a double hill, terminating abruptly. From this a flat tongue of land projects some distance to the South. The flat hill near Flat Bay is the first high land in that direction. By this hill Cape Patience, which, owing to its little elevation, is not easily perceived, may soon be recognised. The cape is surrounded by a rocky shoal, extending a considerable distance off shore.

Robben Island, or *Tuileni*, surrounded by a very dangerous reef, lies off Cape Patience. Capt. Krusenstern saw and examined the extent of this reef. The N.E. front he places in lat. $48^{\circ} 36'$, long. $144^{\circ} 33'$, and that part which may be considered as the S.W. extremity is in lat. $48^{\circ} 28'$, long. $144^{\circ} 10' E.$, so that its whole circumference is about 35 miles. The middle of Robben Island is in lat. $48^{\circ} 32' 15''$, long. $144^{\circ} 23'$, about S.W. $\frac{1}{4}$ S., 22 miles from Cape Patience. The channel between the cape and the reef was not examined.

PATIENCE BAY is extensive, and limited to the East by the cape of the same name, and to the West by Cape Soimonoff. The ship *Catricom*, under the Dutch commander De Vries, anchored here in 1643, and gave the names to the bay, &c. Its North coast is craggy and mountainous, and far inland are lofty mountains.

In the N.W. corner of the bay is the mouth of a tolerably large river, named the *Ny* or *Neva*; its entrance, in lat. $49^{\circ} 14' 40''$, long. $143^{\circ} 10'$, is about half a mile wide. Off its mouth the water was fresher, and branches of trees were among the clayey soundings. Near its entrance is *Tichmenev*, a Russian post. A smaller river debouches to the southward.

Cape Notetu, *Saimanov*, or *Soimonoff*, in lat. $48^{\circ} 53' 20''$, long. $143^{\circ} 2'$, is the western limit of Patience Bay; it is a high promontory, projecting very much to the eastward. **Cape Dalrymple**, named after the English hydrographer, is in lat. $48^{\circ} 21' N.$, long. $142^{\circ} 44'$. It is formed by a high mountain, lying close upon the beach in a North and South direction, and is the more easily known from being altogether isolated. Hence the coast trends S.S.W., consisting of lofty mountains, divided by deep valleys, the shore being steep and rocky. The whole country is more agreeable in prospect than farther South. **Cape Mulozsky**, a projecting point of land, is in lat. $47^{\circ} 57' 45''$, long. $142^{\circ} 34'$. **Bernizet Peak** of La Pérouse is probably the same as **Mount Spanberg** of the Dutch. It is a lofty, rounded mountain, in lat. $47^{\circ} 33'$, long. $142^{\circ} 20'$, and is also known as *Mount Lopatinsky*.

Cape Seniavine is a high point of land, in lat. $47^{\circ} 16' 30''$, long. $142^{\circ} 59' 30''$. To the northward of it the coast is low, and falls suddenly off to the westward; to the southward are lofty mountains.

Morlovinov Bay lies to the southward of this, and is limited to the East by

Cape Tonin. Plenty of water was found in it in many places, and abundance of firewood. *Cape Tonin*, in lat. $46^{\circ} 50'$, long. $143^{\circ} 27' 30''$, is of moderate height, and entirely overgrown with fir trees. A chain of rocks stretches to the northward from it.

Cape Lowenorn, or *Leveron*, in lat. $46^{\circ} 23' 10''$, long. $143^{\circ} 38'$, is a steep projecting rock, easily to be distinguished from the rest of this coast by its yellow colour. North of it the coast assumes a more westerly direction, and consists of a chain of large lofty mountains.

CAPE SIRETOKO, or *Aniwa*, the S.E. projection of Saghalin, is in every respect a remarkable promontory, the more so from a chain of high mountains near it, stretching away to the northward, between which and the cape is a hollow that gives it the appearance of a saddle. The headland itself is a steep, abrupt mass of rocks, perfectly barren, and having a deep inlet at its point. The position was very carefully observed by Captain Krusenstern; it is in lat. $46^{\circ} 2' 20''$ N., long. $143^{\circ} 25'$ E.

ANIWA BAY, occupying the southern end of Saghalin, is an extensive bight, about 45 miles deep, its entrance being 60 miles wide between Cape Siretoko and Cape Notoro to the East. From Cape Aniwa the coast runs first in a northerly direction, and then inclines to the West to a headland, which projects also to the West, and from this, as far as the head of the bay, it runs North and South. In this part of the coast is a rock called the *Pyramid* on the charts. The West side of the bay is throughout very mountainous. A flat and rather projecting mountain, in the direction of the coast, which trends S.S.W., is alone distinguished for its greater height.

Aniwa Bay is open to the southward, but the holding ground is good; along its West shore, in depths less than 10 fathoms, the bottom is soft mud. In winter broken ice is met with, but only at a short distance from the coast. Water is inferior, and difficult to procure; fire-wood can be obtained, but no provisions, except fish, which is abundant.

CAPE NOTORO, *Crillon*, or *Krilon*, the S.W. limit of Aniwa Bay, and the South extremity of Saghalin, from a distance of 10 or 12 miles makes like an island. On its summit, 124 ft. high, is a small shrine, and 4 miles North of the cape is a conspicuous hill, *Quoin Hill*, which rises abruptly from the shore to an elevation of 1,025 ft. A range of hills, varying from 800 to 1,200 ft. in height, amongst which is one of sugar-loaf form, stretches along the coast to the N.E. of Quoin Hill. Reefs of straggling rocks border the cape at a distance of 2 to 3 cables, and off its West side some of them extend a considerable distance. On the latter side, and 3 miles from the cape, near a Japanese fishing-station, is an extensive patch of dangerous rocks, covered at high water, lying about a mile off shore. A heavy tide-race is often met with off the cape.

The **LIGHTHOUSE** on Cape Notoro, established in 1883, is 30 ft. high, and
North Pacific.

exhibits a *fixed* light, elevated 135 ft., and visible 13 miles. The light is *bright* over the bay and seaward between N.E. $\frac{1}{2}$ E. and S.E., southerly; *red* thence, over Kamen Opasnosti or Dangerous Rock, to S.E. by S. $\frac{1}{2}$ S.; and *bright* thence, southward and westward, to N.W. $\frac{1}{2}$ N. Its position is lat. $45^{\circ} 54' N.$, long. $142^{\circ} 2' E.$

Fog Signals.—Near the lighthouse a *Bell* and *Gun* are established for Fog Signals.

Kamen Opasnosti, named *Dangerous Rock* by La Pérouse, $8\frac{1}{2}$ miles S.E. $\frac{1}{2}$ S. from Cape Notoro, is about 20 ft. high, and 60 ft. in diameter, frequented by sea-lions. It should not be approached nearer than a mile, as dangerous rocky ledges extend around it. A less depth than 20 fathoms, when in its vicinity, indicates close proximity.

Taisia or Tishia Rock, 72 ft. high, conspicuously marks the position of the point of the same name, at $8\frac{1}{2}$ miles N.E. by N. of the summit of Cape Notoro. From the rock the coast trends to the N.N.E. towards the head of Aniwa Bay; at 2 miles from it is a reef, three-quarters of a mile off shore. Anchorage may be taken in 8 or 12 fathoms anywhere along the coast between Cape Notoro and Taisia Rock. Good shelter may be obtained here, and also farther to the northward in the bight of the bay, from the prevalent autumnal and winter gales. Water was obtained by H.M.S. *Acteon* at a small stream 2 miles northward of the cape.

At its head Aniwa Bay forms a bay named *Losossi*, *Lucheforellen*, or *Salmon Bay*, on the shore of which are some settlements. It is entirely exposed to the South, which are here said to be the prevailing winds, and consequently the road is by no means safe. The great surf is also an obstacle to landing. The Japanese had here also a large establishment, and Krusenstern's anchorage off it was in lat. $46^{\circ} 41' 15''$, long. $142^{\circ} 32'$. The Japanese factory, at the mouth of the small river, bore N. $49^{\circ} W.$, $2\frac{1}{2}$ miles.

On the East side of this bay is *Kushankotan*, a settlement composed of a few wooden houses and wretched huts, close to which the Shikawa or Salmon River flows into the bay. The point southward of Kushankotan runs out shoal, and should not be approached within 2 miles. *Karsakovsk*, about 3 miles southward of Kushankotan, is a military settlement, with some Japanese villages southward of it. The flagstaff is conspicuous. There is anchorage off Kushankotan, in 6 fathoms, sand and mud, about 1 mile from the beach, with the village bearing E. by S. $\frac{1}{2}$ S.; a shoal is said to lie S.S.W. of this anchorage. Also off Karsakovsk there is anchorage in 5 or 6 fathoms, at about a mile from the shore, the settlement bearing East. *Tamary Aniwa* is apparently the name given by the Dutch to the projecting point on the East side of this bay.

Tobootohi Bay, on the East side of Aniwa Bay, in lat. $46^{\circ} 29' N.$, is a shallow basin with $3\frac{1}{2}$ fathoms in its deepest part. The entrance is between sand-banks extending from the shore, and has only 9 ft. on the bar; two beacons in line on Klykoff Point, the southern point, E.N.E., lead in. On

the southern shore of this bay are the Russian settlements of *Doussie* and *Mouravieff*.

LA PÉROUSE STRAIT.

This strait is formed between Cape Notoro, the southern end of Saghalin, and Cape Soya, the North extreme of Yezo, about 23 miles apart. The general soundings in it are 35 to 40 fathoms and upwards, decreasing to 25 and 20 fathoms as the shores are neared; but as these latter depths will be found in the middle of the strait near Dangerous Rock and in other places, the lead in thick weather cannot always be trusted to ensure safety.

There are heavy overfalls, giving the appearance of a reef, between Cape Notoro and Dangerous Rock, but deep water was found in passing through. Neither this cape nor Cape Nossyab should be closed by a sailing vessel without a commanding breeze, on account of the tide-race off them.

Refunsiri Island, lying off the South side of the western entrance to La Pérouse Strait, is in shape an acute-angled triangle, 11 miles long North and South, and $3\frac{1}{2}$ miles wide at the base which is its North end, where there is a shallow bay, with rather a populous village. The summit of a range of hills, the highest part of which is nearly in the centre of the island, attains an elevation of 1,300 ft., but it is so close to *Pic de Langle* on *Risiri* as to appear to the eye much lower. The island is cultivated, but only a few fowls, fish, and water can be obtained.

The shores of this island appear to be clear of outlying dangers, except the North end, where foul ground appears to extend 8 or 9 miles northward, a dangerous rock, with only 8 ft. water over it, lying at the extremity. Nearly 2 miles North of the N.E. point of the island, and about East $2\frac{1}{2}$ miles from *Bomasiri*, an islet 1 mile northward of the N.W. point of the island, is a dangerous rock, discovered by H.M.S. *Bittern*, in 1855, but it nearly always breaks. *Barriok Rock*, a doubtful danger, is said to lie about 7 miles westward of the island, in lat. $45^{\circ} 23'$, long. $140^{\circ} 41'$.

Risiri Island is about 6 miles S.E. of *Refunsiri*, and the passage between them, and also that between *Risiri* and Yezo, are both quite clear of all known danger, and may safely be taken. This island, from its great height, becomes, for vessels approaching from the southward, a conspicuous mark for the West entrance of La Pérouse Strait. It is nearly circular in shape, with a generally low shore rising abruptly from the sea. No dangers of any importance are known in its vicinity; a few detached rocks exist, but they lie close inshore. It was first seen by La Pérouse, who took it for a mountain on the mainland of Yezo, and named it *Pic de Langle*. Its summit attains an elevation of 5,900 feet, and may be seen in clear weather from a distance of 70 or 80 miles. It is generally capped with snow, and often peers out most usefully above the harassing fogs. According to Capt. Krusenstern's observations, it is in lat.

45° 11' N., long. 141° 12' 15" E., and it is probably the mountain which the Dutch called Blyde Berg.

A bluff point, called *Nakko Head*, jutting out on the N.E. side of the island, forms a small bay, which affords shelter from S.E., round by West, to North. The holding ground is good; the best anchorage is in the N.W. part of the bay, in 6 to 7 fathoms. There is a small village on the West side. The tide rises about 4 ft. at springs, and the current in the vicinity of these islands sets to the N.E., from 1 to 1½ knot an hour.

Totomosiri, or *Monneron Island*, lying N.W. ¼ W., 40 miles from Cape Notoro, is 1,400 ft. high, without the volcanic appearance of Refunsiri or of Risiri. There are three rocks awash lying about a mile off its eastern shore, and another about a mile off its N.E. point. There is a spring on Totomosiri, from which whalers are in the habit of watering, but with great difficulty and labour.

CAPE NOSSYAB, the N.W. point of Yezo Island, was named *Romanzoff* by Krusenstern, and is in lat. 45° 27' 30" N., long. 141° 36' E. It is the abrupt but rather sloping termination of a remarkable table land, and appears like an island at a distance. Extending a mile northward from the cape is a flat, narrow tongue of land, only a few feet above the sea, having upon it a few huts and a fishing station. From the extreme point of this low land a shoal, rocky spit, partly covered with weed, extends N.N.W. upwards of a mile, with but little water over it in places, and at its extremity a depth of 2½ fathoms, which rapidly deepens to 6 and 7 fathoms.

At 6 or 7 miles southward of Cape Nossyab there is anchorage in 12 fathoms in a small bay, with the cape bearing N.N.E., and the summit of Risiri S.W. by W. ¼ W. The shore here is low and swampy.

CAPE SOYA, the North extreme of Yezo, 14 miles E.N.E. of Cape Nossyab, may easily be recognized, sometimes even in a fog, by a remarkable white rock lying off it to the westward, and which appears to be surrounded with broken ground. Reefs extend some distance off the cape, and a reef awash is reported to lie 7 or 8 miles E.S.E. of it.

Romanzov Bay, between Capes Nossyab and Soya, is an extensive bay, in which the land, covered with rank verdure, slopes towards the sea margin. Several huts are distributed along the shores of the bay; and about 5 miles S.W. from Cape Soya is a large Japanese village or fishing station. Reefs extending along the East and South shores of the bay, so that a vessel intending to take shelter here should be careful to keep 3 or 4 miles off shore, where there is bad anchorage in 17 or 18 fathoms. The *Naditjeda*, Capt. Krusenstern's ship, anchored in this bay, at the entrance of a small bay in its southern part, at 2 miles from the nearest shore, in 9 fathoms, an excellent bottom of fine sand and mud.

The Island of Yezo will be described hereafter.

H.M.S. *Acidon*, in September, 1859, while engaged in surveying the islands

Risiri and Refunsiri, was blown by a W.S.W. gale through the Strait of La Pérouse, when the atmosphere was so laden with spray as to render it impossible to fix the position of the ship accurately.

Vessels bound through the strait from the eastward with an adverse wind, would do well to stand across and work to windward in Aniwa Bay, where they would have smooth water, no current, and perhaps find an eddy in their favour.

In and about La Pérouse Strait the tides and currents are very irregular, and they are probably much influenced by prevailing winds. They are felt mostly inshore, particularly round Capes Notoro and Nossyab, where at times they become perfect races. It is high water near these capes, on full and change, between 10^h and 11^h, and the rise is about 6 ft. The flood sets to the East.

THE GULF OF TARTARY.

The entrance of the Gulf of Tartary, which insulates Saghalin, is 180 miles wide between Cape Notoro and Cape Disappointment on the Tartary coast.

From Cape Disappointment, in lat. 45° 48' N., the coast of Tartary or Manchuria trends to the N.E., and forms, with the West coast of Saghalin Island, which trends irregularly to the northward for 370 miles, the long channel named the Gulf of Tartary, which communicates with the Gulf of Amur to the northward by Tartary Strait. This strait may be considered to begin on the parallel of about 51° N.; on the parallel of Castries Bay the coasts converge rapidly; and abreast Cape Catherine, in 51° 57' N., they are only 7 miles apart; 17 miles farther North, between Capes Lazaref and Pogobi, they approach to within 3½ miles; and this is the gorge of the strait, and the entrance into the Gulf of Amur.

The ports most frequented in the gulf are Barracouta Harbour and Castries Bay on its western coast, and Dui, Jonquière Bay, and Kosounai on its eastern. The anchorage along the eastern coast is safe during the summer months, when easterly winds prevail, and there is generally fine weather; but a vessel must be prepared to weigh, should the wind veer to the West.*

The coast on both sides of the gulf is high, and there are no striking landmarks. The eastern shore is thickly wooded, and appears to be thinly inhabited, the natives living chiefly on fish. No dangers have been observed, and the soundings decrease gradually towards the shores.

The navigation of the gulf would be simple enough, but the fogs render it dangerous, requiring the greatest caution to be observed. It has been remarked by former voyagers, and this was confirmed by H.M. ships in 1855-6, that on

* The gulf was visited by H.M.S. *Dwarf* in 1873, and Capt. B. W. Bax has given an interesting account of the chief ports in his book, entitled "The Cruise of the *Dwarf* in the Eastern Seas," published in 1875.

nearing the land in these seas a vessel will frequently suddenly emerge from the fog or find it lift. The inner bays are rarely covered by fogs. The flood tide sets to the northward, and the rise is from 5 to 7 ft.

Wood and water can be procured in abundance and with facility, on all parts of the coast of the gulf, and coal, of fair quality, in any quantity, at Dui, close southward of Jonquiére Bay. Fish and wild fowl are plentiful. Very fine cod-fish have been caught in soundings of from 73 to 80 fathoms.

Fogs.—From March till August fogs are almost continuous in the gulf, with scarcely any clear interval for more than a day or two at a time; they are most prevalent and dense in June, and are immediately dispersed in N.W., West, and S.W. winds; the mercury is little affected by them. The prevalent winds are described at the end of this work.

In August, September, and part of October, fair clear weather comes in agreeable contrast, although in the latter month snow occasionally falls. The change of weather about the middle of October is sudden. winter generally usurping the warmth of summer in a day, and setting in with all its vigour; at this period ice begins to form in Tartary Strait, and the season for sailing vessels to be in the gulf on ordinary occasions must be considered as having terminated. In winter, from Castries Bay to Dui, the strait is closed by ice as far as the eye can reach. It begins to disappear early in April.

We now proceed to describe the shores of the gulf, commencing with the West coast of Saghalin, and then the opposite coast of Tartary from Cape Disappointment northward.

From Cape Notoro (p. 753) the West coast of Saghalin trends northward for 40 miles to *Nyassi Point*, and is from 100 to 150 ft. in height. At 6 or 7 miles northward of Cape Notoro is a stream, an excellent watering place, with anchorage off it in 9 to 10 fathoms, sand. Northward of *Nyassi Point* is *Nevelskoi Bay*, consisting of numerous small bights, with passages leading to them between the reefs fronting the shore, of which *Maucka Cove* is the principal. For the following and other information we are indebted to Captain Anderson, S.S. *Appin*, 1880.

Maucka Cove, or *Endungomo*, in lat. $47^{\circ} 3' N.$, is about 6 cables long East and West by 3 cables wide, and is the head-quarters of a fishing company, employing about 700 coolies. There is a small guard of Russian soldiers here. The average depth in the cove is 4 to 5 fathoms, with room to moor a vessel 250 ft. long. Fine timber grows in the neighbouring valleys, and spars of any size may be obtained. Potatoes and other vegetables are grown, and fresh water can be procured from a stream. Coal has been found about a mile inland. Fish and game are plentiful.

To enter the cove, bring two poles in line S.E. $\frac{1}{4}$ S., and steer for them, letting go the first anchor when about half a cable within the reefs. Mount *Bernizet*, or *Lopatinsky*, is an excellent landmark, rising in a sharp peak.

In the vicinity of *Maucka*, and to the southward, are several trading stations,

with anchorage off each, more or less exposed to the northward. That off *Pivots* is the next best to Maucka Cove.

Poro Tomari is a similar bight, 5 miles northward of Maucka Cove, with a narrow entrance between the reefs. *Notoro Point*, 10 miles farther northward, is triangular in shape, and conspicuous. *Toubout* or *Notosama Bay*, in lat. $47^{\circ} 25\frac{1}{4}'$, is sheltered by reefs above water, and is about 6 cables in diameter, with 4 to 6 fathoms water over it, affording shelter for one or two small vessels. For 10 miles northward of this the coast consists of clay cliffs.

Kosounai.—Between lat. $47^{\circ} 52'$ and $48^{\circ} 2'$ the coast forms an open bay, with low and sandy shores, affording a convenient landing when the sea is not rough. Saghalin is here only 15 miles wide. At the head of this bay is *Kosounai*, a Russian settlement of large white log houses, on the North side of a small river. There are three pyramid beacons here, 40 ft. high. Game, fish, and fire-wood are plentiful, and 3 miles northward there are large quantities of coal.

At 30 miles North of Kosounai is *Raitsiska River*, with 4 ft. water on the bar, leading to a lake. Northward of this, between lat. $48^{\circ} 35'$ and $48^{\circ} 50'$, the coast is a steep bluff 800 ft. high, backed by high peaks. *Stoukambiss Point*, in lat. $48^{\circ} 43'$, is easily recognised by a white crescent-shaped patch on the S.W. side of a hill inland. *Tzilmietiev Bay*, northward of this, is about 3 miles wide, but is a very insecure anchorage.

Orokes Bay, or *Tang Kotan*, the Baie d'Estaing of La Pérouse, in lat. $48^{\circ} 56'$ N., affords good anchorage in S.W. gales, but is open to winds between W.S.W. and North. There is a depth of 6 fathoms at the entrance, decreasing gradually to its head. *Cape Oroji*, or *Baranov*, in lat. $49^{\circ} 23'$, rises to a height of about 200 ft., and is backed by a fine grassy slope. About 7 miles northward of this is *Nyassi River*, with 6 to 7 ft. on the bar, and a village on its South side. Hereabout the bottom is rocky, and the depth irregular.

Sertunai, or *Sokkota*, is a small Russian post, $2\frac{1}{2}$ miles northward of Nyassi River, in the neighbourhood of which are some coal mines. The anchorage here is bad. This locality was visited by Lloyd's agent at Alexandrovski in Castries Bay, in 1867. He says:—The coal mines at *Najassoe* are in about lat. $49^{\circ} 35'$ to $49^{\circ} 40'$. I found that vessels can lie and load there, without particular danger, in an open roadstead, the loading place being to the North of the river. The depth of water, about 1 mile from shore, is 13 to 16 ft., deepening to 8 and 9 fathoms at 3 to 4 miles from shore. Weather mostly calm during summer; winds, from April to September, mostly moderate, from N.E. to S.S.E.; later, the winds turn over South to West, and cause the swell to set towards Saghalin. During the spring fogs on the West side of the gulf, the Saghalin coast remains nearly always and entirely clear.

Cape Vozdovienia, in lat. $49^{\circ} 56'$, is a bluff about 100 ft. high, with a high rock off it. *Karsakov Bay*, in lat. $50^{\circ} 5'$, affords shelter from S.W. winds, and has a village on its shore. *Cape Pilwo*, its South point, is surrounded by a

reef, and nearly half a mile from it are two rocks above water. From hence as far as Dui the coast is high and bold, and a reef is said to extend a short distance off it. In lat. $50^{\circ} 12'$ is *Kitousi Hill*, a remarkable peak, 2,000 ft. high. *Kosakevitch Bay*, in lat. $50^{\circ} 19'$, affords shelter from S.W. winds, in 18 ft. water. In the vicinity are two sharp hills, about 6 miles apart, the southern one lying 2 miles southward of the bay.

DUI, in about lat. $50^{\circ} 50'$ N., long. $142^{\circ} 5'$ E., is a Russian settlement on the shores of a small bay formed by Cape Hoidji on the South, and Cape Otsisi on the North. In the vicinity are a saw-mill and large coal mines, worked by convicts. The coal, which is said to be nearly equal to North country coal for steaming purposes, is largely shipped to Castries Bay, for the use of the Russian squadron at Vladivostok and the Amur. It is loaded into boats from a pier about a mile northward of the settlement; its price is about 10 roubles (£1) per ton. There is a telegraph cable to Castries Bay.

LIGHTHOUSE.—A square lighthouse, 40 ft. high, stands on the slope of a hill overlooking the settlement, and from it is shown a *fixed bright* light, elevated 374 ft., and visible 22 miles, between N. by E. $\frac{1}{2}$ E. and S.W. $\frac{1}{2}$ W. In foggy weather a *Bell* is sounded slowly, but will be sounded rapidly when a vessel's signal is heard. A *Gun* will be fired in answer to a gun fired at sea.

Cape Hoidji, near which is a waterfall, appears perpendicular from the southward, gradually rising inland to a mountain summit. A reef extends nearly 6 cables N.W. by N. $\frac{1}{2}$ N. from the cape, and is marked by two beacon buoys, 60 ft. apart, in $4\frac{1}{2}$ and $4\frac{1}{2}$ fathoms. Here the coast curves to the eastward, with high red cliffs, broken by gullies. *Cape Otsisi* ends in a conical rock, close to which are three remarkable pinnacle rocks, 50 ft. high; a reef extends northward of the latter, the extremity being marked by a perch beacon.

Owing to the foggy weather, and the uncertainty of the current, it is advisable to make the coast South of Cape Hoidji. The reef off this cape will be cleared by keeping Cape Otsisi bearing N.E. until the lighthouse bears southward of East, when steer for it. Small vessels can lie off the pier in 3 fathoms, with the lighthouse bearing E.S.E.; but larger vessels should anchor in 5 to 6 fathoms, with the pier bearing East, and Cape Hoidji S. by W. The anchorage is only safe with easterly winds. A black mooring buoy lies in 5 fathoms, about half a mile West of the pier.

JONQUIERE BAY, a small convict settlement, about $1\frac{1}{2}$ mile N.E. of Cape Otsisi, is in lat. $50^{\circ} 54'$ N., and may be recognised by the rocks off that cape. This bay should be looked upon only as a fine weather anchorage. It affords shelter from N.E., round by the East, to South, but is exposed to all other winds, and the holding ground is mostly bad, with one or two good spots in 7 to 9 fathoms.

A small river finds an outlet in the bay, and boats can pass over its bar when the tide is in. A few native huts will be seen on the South side of the entrance, and between these and Cape Otsisi, or Pinnacle Point, are seams of

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Large quantities of fish were taken in Jonquière Bay by hauling the seine on the beach to the northward of the huts, and good sized flat-fish were caught with hook and line about a quarter of a mile off shore, in 3 or 4 fathoms water. Wild fowl and white hares are numerous. The watering place is inconvenient. Drift-wood is plentiful. The natives are inoffensive and obliging.

Tides.—The time of high water, on full and change, in Jonquière Bay, is 10^h, and the rise is about 6 ft.

From Jonquière Bay the coast trends to the N.N.W., and is bold of approach as far as Cape Uandhi, from which to Cape Liak, at the entrance to the Strait of Tartary, it appears as an immense plain, skirted by a shoal bank, with 5 to 6 fathoms at $1\frac{1}{2}$ mile off. *Cape Tyk*, in lat. $51^{\circ} 40'$, is a low, sandy, projecting point, fringed with sand-hills.

Northward of Cape Tyk as far as *Cape Golovachef*, a distance of 100 miles, the coast of Saghalin is mostly low and sandy, with numerous streams and lagoons. On *Cape Pogobi*, in lat. $52^{\circ} 12\frac{1}{2}'$, at the narrow part of the entrance to the Gulf of Amur, is a beacon; this cape has a landslip on its southern side, and a white house on its North side.

The West coast of Saghalin having thus been described, we now proceed to give a description of the western coast of the Gulf of Tartary, surveyed by Colonel Bolshef in 1875.

Cape Disappointment, or *Bielkyna*, in lat. $45^{\circ} 47' N.$, has rocks extending a cable off it. When bearing N.N.E. the land shows in three peaks, close together. The coast to the north-eastward is hilly, and in lat. $47^{\circ} 3'$ is *Mount Baross*, 8,400 ft. high.

Suffrein Bay, formed by Cape Suffrein to the South, in lat. $47^{\circ} 20' N.$, is but an exposed anchorage, surrounded by vast forests which extend out of sight. The cape is fronted by rocks, which stretch half a mile into the offing. *Grossevitcha Bay*, or *Fish River*, in $47^{\circ} 55' N.$, has anchorage off its entrance in 9 fathoms, at about a mile from the land, sheltered from N.W. and westerly winds. *Pestchani* or *Low Point*, in lat. $48^{\circ} 28'$, lies between two bluff headlands, and there is a table-hill, 1,800 ft. high, a short distance westward of it. A depth of 8 fathoms was obtained at a mile off shore.

From Low Cape the coast-line northward is irregular for 15 miles; its trend is then N. by E. 20 miles to *Beachy Head* or *St. Nicholas Point*. It is wooded and steep-to, the lead giving 14 to 17 fathoms at 2 miles off shore. High snowy mountains are visible inland.

BARRACOUTA or Hadshi Bay.—The entrance to this bay (named, also, *Port Impérial*), in lat. $49^{\circ} 2' N.$, is between *Freeman* or *Milkoutina Point* on the North, and *Tullo Island* on the South, which bear N. by W. and S. by E., about three-quarters of a mile apart. The general depths in the bay are 5 to

North Pacific.

15 fathoms over a mud bottom. The entrance is open to the north-eastward, but within the bay are several inlets, which afford sheltered anchorage for all classes of vessels. The bay remains frozen for about the same time as Castrics Bay. Its shores are covered with wood fit for building purposes, such as the larch, fir, and stone-pine. Wild fowl and fish can be obtained here. Russian war-vessels resort to Pallas Bay for wood.*

The only danger is *Carr Bank*, with $1\frac{1}{2}$ and 2 fathoms on it, which extends a cable off shore on the N.W. side of the entrance, one-third the distance between Sybille Head and Freeman Point. On the N.E. end of Tullo Island is a white pyramid *beacon*, 27 ft. high, and there is a similar one on Pushiashina or Hill Point, half a mile to the eastward.

Off the entrance of *Babbington Harbour*, the southern and largest inlet, is *Ustritza*, or *Fortescue Island*, $1\frac{1}{2}$ mile S.W. by W. from Tullo Island. This inlet trends nearly 4 miles to the S.W., *Imperial River* flowing into its head. *Zapadnaia* or *Pique Bay* trends 3 miles westward, and on its North shore, 3 miles westward of Tullo Island, is the small Russian military settlement of *Konstantinowski*, with a pier, on the shore of *Pallas Bay*. The best anchorage in Barracouta Harbour is off this settlement, in 6 to 8 fathoms. *Ice Harbour*, the northern inlet, is only 3 cables wide. It is high water in the harbour, on full and change, at 10^h; the rise is 3 to 4 ft.

In approaching the harbour from the northward, and having made Barren Bluff, the centre one of three hills over Beachy Head forms a good mark to lead to the entrance. Vessels from the southward should make the land near Beachy Head. The beacons on Tullo Island and Hill Point indicate the entrance.

Vessels approaching the harbour in foggy weather should not shoal their water under 40 or 35 fathoms, unless well assured of their position, and in all cases due allowance must be made for currents. They are sometimes extremely variable.

The **COAST** from Beachy Head trends in a northerly direction to Castrics Bay, and is steep-to; 25 and 30 fathoms have been obtained at a cable's length off *Cape Byki*, in lat. $49^{\circ} 33' N$. The coast assumes a bolder aspect in proceeding northwards.

In lat. $49^{\circ} 17'$ is *Barren Bluff*, or *Lesseps Point*, a high perpendicular headland, S.W. of which vessels will find shelter during winds from N.N.E. to N.W., in 5 or 6 fathoms. *Cape Byki*, or *Destitution*, in $49^{\circ} 46' N$, is bold, high land, having a bay on its North side which affords good shelter in winds

* This bay was discovered by H.M.S. *Barracouta*, May 12th, 1856. The Russian settlement is in an inlet on the western side of the harbour, the entrance of which is $1\frac{1}{2}$ mile within the outer points. Here, at the head of a small bay, were found the burnt remains of the Russian frigate *Pallas*, which escaped our cruisers in 1854-5. The settlement is built on a rising ground cleared of wood, and supplied with water from two artificial wells.

from S.E. to S.W., in 9 or 10 fathoms. Inland it is closed by a shelving beach, on which are scattered some Tartar huts.—(*Mr. Tronson*). *Cape Siourkoum*, or *Dent*, a rugged, bluff headland, in $50^{\circ} 5' N.$, declines to the eastward, and has a bay on its North side; close off it is *Gulf Rock*, a pinnacle about 20 ft. high.

In lat. $51^{\circ} 16'$ is *Cape Duga*, abreast which are two stony islands, and about 5 miles farther northward is a remarkable headland, presenting, when bearing N. by E. or S. by W., the appearance of a rocky column, with a round knoll behind it. A few miles beyond this is the entrance of Castries Bay.

CASTRIES BAY is used by vessels to procure a pilot, or to discharge their cargoes, when bound to the Amúr, as those above 12 ft. draught cannot enter that river. Its entrance is 4 miles wide between *Kloster-camp* or *Quoin Point*, on the South, and *Castries Point* on the North, the former being marked by a lighthouse, and the latter by a beacon. Rocks extend off both these points. Although the greater part of the bay is open to easterly winds, which throw in a heavy sea, yet vessels, if their draught will permit, will find shelter behind the islands in it, particularly at its head on the West side of *Observatory Island*. The bay is covered with ice from the middle of November or December to April. The isthmus which separates it from the principal branch of the Amúr is not more than 40 miles across, and Lake Kyzi is only 15 miles distant. At the head of the bay is the Russian settlement *Alexandroviski*, founded about the year 1855, composed of about forty wooden houses, inhabited by a guard of about 100 men. According to the Russian chart, *Alexandroviski* is in lat. $51^{\circ} 28' 2'' N.$, long. $140^{\circ} 48' 48'' E.$

Fish may be obtained from the natives; flour and sugar in small quantities, and occasionally meat and potatoes, can be obtained. Fresh water can be procured from the stream at the settlement, and fire-wood is abundant. There is communication by road with the Amúr River and other Russian settlements, and telegraphic communication with China, Japan, Vladivostok, Nikolaevsk, and Dui.

The **LIGHTHOUSE** on *Kloster-camp* or *Quoin Point* is painted red with a white lantern, and shows a *fixed bright* light, elevated 262 ft., and visible 18 miles. The light is reported to be shown only from May 13 to November 13, and sometimes to be only visible 4 miles. In foggy weather a *Bell* is sounded, and a *Gun* will answer guns fired at sea.

Oyster Island, $1\frac{1}{2}$ mile S.E. by S. $\frac{1}{2}$ S. from *Observatory Island*, is 2 cables long; a reef extends $3\frac{1}{2}$ cables northward of its North point, the extremity being marked by a red and white *beacon*. *Novik Bank*, with only 5 ft. on it, lies about midway between *Oyster* and *South Islands*; a white *beacon* marks its North end, and a red one its South end.

Vostok Bank, or *Danger Rock*, upon which the sea occasionally breaks heavily, but which does not show in smooth water, lies in the middle of the entrance, with the western part of the promontory (the East extreme of which is *Quoin Point*) in line with the bluff headland beyond, bearing about South. Its

N.E. end is marked by a red and white *buoy*, and its S.W. end by two red perches.

On *Klikoff Point*, westward of the settlement, are two white triangular *beacons*, 90 and 66 ft. high, which in line, bearing W.N.W., lead nearly midway between Vostok Bank and Oyster Island, and to the anchorage.

Vessels should not anchor in the bay South of Oyster Island, the holding ground being soft and bad. The best anchorage is with Castries Point bearing N.E. by E. $\frac{1}{2}$ E., and St. Catherine Point S.E. by E. For large vessels the best anchorage is in $4\frac{1}{2}$ fathoms, mud, 4 cables W. by S. from Oyster Island.

Directions.—In making the bay from the southward, the two small and barren islets off Cape Duga will be seen, about 16 miles southward of Quoin Point. At half a mile northward of D'Assas Point, on the North side of the entrance, is a small waterfall, a useful mark in foggy weather. In entering the bay, the beacons on Klikoff Point in line, bearing W.N.W., will lead between Vostok Bank and the reef extending northward of Oyster Island, in 8 to 7 fathoms. The North end of Observatory Island, bearing West, leads well northward of Vostok Bank.

It is high water in Castries Bay, on full and change, at $10^h 30^m$; springs rise $8\frac{1}{2}$ ft., neaps 4 to $5\frac{1}{2}$ ft.

Pilots.—There are no authorised pilots between Castries Bay and the Amúr River, but boatmen can be obtained by applying to the military commander at Alexandrovski, and to the captain of the port at Nikolaevsk, who are well acquainted with the channels of the river. The government make no charge for this service, but a sum of 50 roubles is generally given to the men. Captain Anderson, S.S. *Appin*, recommends captains of steamers under 13 ft. draught to dispense with the services of these men, unless able to communicate with them in the Russian language.

Cape Suschef, or *Sutchoff*, $14\frac{1}{2}$ miles N.E. $\frac{1}{2}$ N. from Castries Point, has a small bay northward of it, affording anchorage in 4 to 5 fathoms. Northward of this the water becomes shallower towards the entrance of the Gulf of Amur. *Capes Catherine* and *Nevelskoi* are steep, bold headlands, about 4 miles apart, and densely wooded; the former has a white cliff, and about 3 miles N.N.E. of the latter is a shoal, the South side of which is marked by a red *buoy*.

GULF AND RIVER AMUR.

The GULF of AMUR, or Saghalin, is 70 miles long, North and South and 25 miles at its greatest breadth. The waters of the River Amur, which run into this vast basin with great rapidity, have formed banks of sand and mud, which cover almost its whole surface, barely leaving the shallow channels by which the stream flows on one side to the Sea of Okhotsk, and on the other to the Strait of Tartary; this renders the entrance of this great river difficult, and at times dangerous.

South Channel.—Immediately North of Cape Lazaref, at the South entrance of the gulf, the channel from the Strait of Tartary divides into two branches. That which goes to the N.N.W., narrow and slightly winding, is called the *South Fairway*, and keeps close to the Tartary shore. It has a tortuous course to Nikolaevsk, which is 65 miles from Cape Lazaref. The channel varies from a quarter of a mile to 2 miles in width; the depths are generally small, but occasionally are as much as 14 and 19 fathoms. The least water is $2\frac{1}{2}$ fathoms, and a flat with this depth extends for nearly 10 miles between Capes Korsakof and Prongé, and this may be considered the real bar of the river, and must be crossed to enter it. Beyond this bar the water deepens, and 11 fathoms is found abreast the town of Nikolaevsk, above which the river is said to be navigable for 1,500 miles.

The N.N.E. branch, or *Saghalin Fairway*, is wider and deeper than the other, the least depth being 18 ft. at low water. It keeps along the Saghalin shore, at about 5 miles distant, for nearly 60 miles, until just North of Cape Halezof, where it almost touches the coast; and 20 miles farther North, between Capes Golovachef and Menshikof, 16 miles apart, it opens out into the Sea of Okhotsk.

The North Channel, a narrow gut, leads close to *Cape Tobakh*, the North entrance point of the Amur, and then trends 30 miles N.E. to the Sea of Okhotsk, from which it is separated by a bar with only 6 ft. over it.

THE RIVER AMUR, or *Saghalin Ula*, is formed of the streams Shilka and Argun, which unite in lat. $53^{\circ} 30'$ N. on the frontiers of Russia and China. The former of these consists of the Ingoda and Onon; the latter being the main stream which rises S.E. of Lake Baikal, in the mountain chain called Khing-khan Ula by the Chinese, and Yablonoi Krebit by the Russians.*

The river flows East as far as Nertchinsk, where it is said to be 600 yards wide, and very deep; then North, then again East, when it receives the Argun, which comes from the South near Baksanova. The united streams, under the name of Amur, continue to the East and S.E., receiving from the South the affluents Sungari and Usuri, and reaching its southern limit in $47^{\circ} 48'$ N., at the *Mariensk Post*, or *Kisi*, one of the most important Russian stations on the Amur. A battery has been constructed that commands both the entrance to the port and the river. It is from this post that the overland route to Caestries Bay (page 763) starts. It would be a most important line for a railway. From Mariensk the river turns abruptly to the N.E. and East, falling into the Gulf of Amur between Capes Prongé and Tobakh, which are 8 miles apart, and both are fortified.

* The work by the late Thos. W. Atkinson, Esq., F.R.G.S., entitled "Travels in the Regions of the Upper and Lower Amoor," London, 1860, is, with his previous work, "Oriental and Western Siberia," 1858, a most interesting account of this accomplished artist's long residence and journeys in these previously almost unknown regions.

The length of the Amur, including all its windings, is about 2,600 miles; it is navigable for large vessels as far as Nertchinsk, 1,500 miles from its mouth, in the summer season; in the winter it is frozen over. There are now a large number of steamers on the Amur, the season when the river is open being limited to about half the year. Its mouth becomes frozen over about the beginning of November, and the navigation does not open again before May.

At Nikolaevsk, in spring and summer, winds from the eastward and southward prevail, bringing fog and rain. In autumn North and N.W. winds blow.

Nikolaevsk.—The fortress of Nikolaevsk is built on the left bank of the river, at 22 miles from the entrance. It is surrounded by wooden houses, and was defended by batteries and strong advanced works, which were nearly all dismantled, when the Russian naval and military station was removed to Vladivostok. There is telegraphic communication with Europe, and also with the Russian settlements. The river is about 2 miles wide abreast the town.

Supplies and assistance in the way of repairs are difficult to be obtained at Nikolaevsk. Bullocks and salmon, however, may be procured. Timber is plentiful, and the forests extend as far as the eye can reach, but the export of wood is strictly forbidden. The river water contains much lime, and removes the paint from the bottoms of boats.

Directions.—A vessel entering the Gulf of Amur from the Strait of Tartary should proceed with great caution, with a boat sounding on each bow, and an anchor ready at a moment's notice. At different intervals great changes have been announced in the channels. In 1860 the South Fairway Channel was buoyed, and conspicuous wooden beacons were erected on the land to guide through the different bends.

Merchant vessels have often remained aground in it for weeks together, and frequently had to throw a portion of their cargoes overboard to lighten. It will thus be seen that no permanent directions can be given for this navigation.

The channels leading from the gulf to the anchorage abreast Nikolaevsk are frequently changing, owing to the great amount of débris sent down by the strong current of the river, and with the constant fogs, frequent squalls, and gales, would render the approach both difficult and dangerous, were it not for the admirable way in which they are buoyed and beacons.

Tides.—The flood sets to the N.E. along the coast of Russian Tartary at the rate of 2 miles an hour. At Cape Lazareff the tide flows twice in the twenty-four hours; the rise is 6 ft., and sometimes as much as 9 ft. at springs, and the ebb runs $3\frac{1}{2}$ to 4 knots. Off the Hagemir Islands the rise is 2 to 3 ft., and the ebb runs 2 to 3 knots. Abreast of Chomé Island the rise is 4 ft., and the water remains at its highest level about fifty minutes. From Cape Djaoré, or Korsakof Point, to Cape Prongé, there appeared to be no regularity in the tidal action, it being greatly influenced by the winds. It was high water only once in twenty-four hours, and the tide rose 1 foot with a southerly and 3 ft. with a northerly wind.

During the few days H.M. ships were off the northern entrance of the Gulf of Amur, in 1855-6, the greatest rise of tide observed was 5 ft. The current from the Amur set to the N.N.E., over the banks, sometimes 3 knots an hour.

THE COAST OF MANCHURIA, OR RUSSIAN TARTARY.

The coast of what is now Russian Tartary was but little known till the imperial power in China began to decline. When internal rebellion, and external influence were brought to bear on that enormous empire, the countries which surrounded it, and over which it may be said that its way was but limited, became of even less importance, and thus the Manchurian territories were the more easily ceded to Russia, when the Amur and the adjacent countries were settled, and commerce opened. The Russian boundary has been made to gradually encroach on the Chinese regions, and is now established at the Tuman River, the mouth of which is in lat. $42^{\circ} 18' N.$ *

The coast of the Korea will be found fully described in the China Pilot, published by the Admiralty. To give a full description of a coast seldom or never visited by European vessels is thought to be beyond the scope of this work.

In the following brief remarks, extracted from the China Pilot, we commence with the southern point, at the Korean boundary. The coast has been surveyed at different times, and hence there is some confusion of names, but they are given as adopted in the China Pilot.

Surveys of various parts of this coast were made by several British and French officers between 1852 and 1855, but the Russians made a more complete survey during the years 1859—1866.

POSIIETTE BAY, or **D'Anville Gulf**, is comprised between *Sisuro Point* to the S.W., and *Cape Gamova* or *Hugon* to the N.E., about 33 miles apart. This latter cape, rising 1,800 ft. above the sea, is the end of a peninsula extending to the South. It is visible 30 miles off, and, coming from the N.E., is a good landmark for this bay, as *Sisuro Point* is from the South.

To the N.W. the bay contracts, forming a strait 4 miles long, and about $2\frac{1}{2}$ miles wide, known as *Pallada Road*, contracting at its N.W. extreme to a narrow passage the navigable channel of which is further lessened by *Toherkarsky Island* and shoals, leaving only a channel of a little over a cable in width communicating with two larger basins named *Novogorod* and *Expedition Bays*, completely landlocked, and affording perfect shelter to any number of vessels. It is said never to be frozen over. The shores are mountainous, but the land at the bottom of the bay is low, marshy, and broken by a range of steep bluffs.

Furugelma Island (*Cassini Island*), lying in the S.W. part of *PosiETTE Bay*, is 3 miles in circumference, and 413 ft. high, forming a good mark for entering

* A detailed account of these Russian acquisitions is given by Dr. W. G. Blackie, F.R.G.S., in the Journal of the British Association, 1868.

the bay. There are two villages on its West face. A reef of rocks extends more than half a mile from its S.W. point, and another reef projects fully 1 mile from its N.W. point. At half and two-thirds of a mile N.E. by N. $\frac{1}{2}$ N. and E. by N. $\frac{1}{2}$ N. respectively from its N.E. point lie *Pilier* and *Buoy Rocks*; the former is 30 ft. high, but the latter hardly shows at high water.

Kalavala or Moule Bay is partly sheltered to the S.E. by *Furugelma Island*, and to the N.E. by *Bodisko Peninsula*, the summit of which, named *Mount Direction*, is 820 ft. high. The bay is $1\frac{1}{2}$ mile deep, North and South, and 1 mile wide at the entrance, which is narrowed by a reef of rocks, awash, stretching nearly 2 cables off the West shore. With the wind from S.E. to S.S.E. a heavy swell sets in, making the anchorage unsafe, and the holding ground is not good. The highest tides observed rose about $3\frac{1}{2}$ ft.

Pallada Road, comprised between *Mount Direction* to the South, and *Cape Deger* or *Klaproth Point* to the North, is 5 miles deep, N.W. and S.E., with a mean width of 3 miles. It affords fair anchorage within *Balbi* and *Malte Brun* (*Ostrano*) Points, the inner points of the bay, in 12 to 5 fathoms, over mud bottom, open to S.E. *Klikova* or *Yedo Rock*, with 10 ft. on it, lies nearly in mid-channel at the entrance to Pallada Road, with *Ostrano Point* bearing West, distant $3\frac{1}{2}$ miles; it can be readily distinguished by the white seaweed on it.

Expedition Bay is a good and secure harbour, and affords a safe retreat for vessels not wishing to ride in a south-easterly gale in Pallada Road. The entrance to it is nearly half a mile wide, but it is divided into two channels by a large bare rock named the *Mingan* or *Tcherkasky*. The eastern of these channels should on no account be taken. The other channel on the West side of the *Mingan* must be entered with caution, for it is narrow, and a shoal extends nearly half-way across from *Tchurkhoda Rock*, so that it is advisable rather to close the *Mingan*. Entering the bay, take care to avoid a small knoll of $3\frac{1}{2}$ fathoms, nearly in the centre of the fairway. The observation spot on *Tchurkhoda* or *Musoir Rock*, is in latitude $42^{\circ} 37' 50''$ N., longitude $130^{\circ} 48' 45''$ E., approximate.

It is high water at the entrance to Expedition Bay, on full and change, at $2^h 30^m$, and the rise is about $2\frac{1}{2}$ ft.

Coal is obtained from coal-pits on *Mokhouvey Peninsula*, about 3 cables N.E. of *Tyrol Point*, and here is a Russian settlement. Vessels can anchor off the coal-pits in 18 ft. water, mud bottom, at $2\frac{1}{2}$ cables from the shore. There is telegraphic communication with the other Russian settlements.

Novgorod Bay, or Port Louis.—After passing through the channel between the *Tchurkhoda* and *Tcherkasky Rocks*, *Novgorod Bay* will open out to the eastward. There are no dangers after the harbour is open. Anchorage may be taken anywhere in mid-channel.

A hard sandy spit runs across the upper part of the harbour, above which is a large lagoon. The harbour abounds with fish. There are several small runs

of good water; there are also various beds of oysters, and one of large mussels. The hills are covered with long grass, and abound with pheasants, partridges, and foxes; and the low ground, which is swampy, with woodcock and snipe. There are several villages of Manchu Tartars here.

PETER THE GREAT BAY.—Eastward of Cape Gamova the coast forms a deep bight 50 miles across, between it and Askold Island, divided by a peninsula, which projects southward from its head, and a chain of numerous islands, into two deep bays, the western of which is named Amur Bay, and the eastern Ousouri Bay.

Korsakov or *Peeles Island*, about $2\frac{1}{2}$ miles long, lies about 11 miles W.N.W. of Cape Gamova, and a chain of islets and rocks extends nearly 3 miles N.W. of it. Off the S.E. point are several high rocks. Approaching from the southward it appears as two islands.

Dournovo, *Hildebrandt*, and *Dalevron Islets*, about 100 feet high, lie from $2\frac{1}{2}$ to $3\frac{1}{2}$ miles N.W. of Korsakov; two rocks, awash, lie 1 mile N.W. of Dalevron, the northern island, and two others southward of it, all marked by beacons.

Redcliffe Island lies about 3 miles N.E. of Korsakov, and a reef, marked by beacons, lies about 4 cables N.W. of its North point. To the N.N.W. of it are *Antipanko* and *Sebereakov Islands*, connected by a reef, both high and rocky, and covered with vegetation.

Manjoo or *White Cliff Bay*, a large open bay westward of the latter islands, apparently affords good shelter, but the South point, with rocks off it, should not be approached too near.

AMUR BAY, or *Guerin Gulf*, extends 35 miles N.E., with an average breadth of 8 miles; there are several good anchorages in it.

Slavianski Bay, or *Port Bruce*.—About $2\frac{1}{2}$ miles northward of Antipanko Island is a conspicuous cliffy point, which forms the S.E. point of a secure and deep bight, named Slavianski Bay, which forms an excellent harbour, and is well protected by the Eugénie Archipelago. The soundings are regular, and a vessel may anchor in 4 fathoms, good holding ground, near the head of the N.W. bay, where there is a small river. Fish and potatoes were procured from the natives. Vessels entering should pass South of Gerasineov Island.

When abreast Slavianski Bay, *Mount Virginie*, a high table hill, will be seen to the north-eastward, with a tuft of trees on its summit; and farther, in the same direction, another named *Mount Winchester*, a rocky and elevated promontory, the eastern slope of which terminates in a low sandy point named *Pestchanoi*, in lat. $43^{\circ} 11' N.$ H.M.S. *Winchester*, 1855, anchored in $6\frac{1}{2}$ fathoms, mud, with this point bearing S. by W. $\frac{1}{2}$ W., and Retohnoi Islet N.E. by N. $\frac{1}{2}$ N.; this anchorage is good, and quite landlocked. A provision depôt is established in this bay for the use of the Russian troops stationed on the Sui-fun River.

North Pacific.

5 F

The head of Amur Bay forms an extensive shallow bight, the shallow *Sui-fun* flowing into its N.W. extremity. There is a Russian military post on the river, and near it are some Government saw-mills.

The distance from Pestchanoi Point to the entrance of the river is 7 miles. A vessel might anchor within 3 miles of the entrance, as the depths gradually shoal towards it. Good water can be procured about a mile from the entrance. Wood can be obtained on any part of the coast, the land being covered with trees, and the beach with drift-wood.

EUGENIE ARCHIPELAGO consists of a chain of high islands, extending 20 miles S.W. of Muravief Amursky or Albert Peninsula.

Kazakavitch Island, the largest of the chain, and separated by the Eastern Bosphorus from the Muravief Promontory, is about 8 miles across, and deeply indented in many parts. It is mountainous, and thickly wooded. *Novik Bay*, or *Port Deans Dundas*, on its N.W. side, is a long and narrow inlet, extending nearly to the S.E. point. It is $8\frac{1}{2}$ cables wide at its entrance, and is very clear of dangers, having depths of 8 to 5 fathoms to within a mile of its head, where it suddenly shoals. *Voevoda Bay*, or *Port Stewart*, and *Boyarin* or *Wilder Bay*, and several other smaller bays on the West coast of Kazakavitch, also afford shelter for ships of the largest draught, and no doubt good water can be procured by digging wells. Westward of Voevoda Bay two buoys and three beacons are moored in line in about 11 fathoms, half a mile apart, for testing the speed of vessels.

Paris Bay, on the N.E. side of Kazakavitch, immediately westward of Skrypleff Island, affords sheltered anchorage in 9 fathoms. *Ajax Bay*, North of Paris Bay, has several shoal patches in it, *Skriabin Bank*, lying near its centre, being marked by a beacon.

Popov, *Reineke*, and *Rickord*, the next largest islands, lie to the S.W. of Kazakavitch, *Japanese Strait* or *Fellowes Passage*, the passage between the two latter, having depths of 8 to 15 fathoms. *Virkhovski Islands*, nearly 3 miles S.E. of Reineke, are low; the S.E. island is marked by a pole beacon. *Karamzin Island* lies $1\frac{1}{2}$ mile S.E. of Rickord Island; and four other islands lie S.W. of Rickord, the outer of which is *Jeltukhin Island*. *Tsivolko*, $1\frac{1}{2}$ mile W.N.W. of Jeltukhin, is marked by a beacon, and has a remarkable hole through it. *Currie Channel*, between the latter and Antipanko Island, is 6 miles wide.

EASTERN BOSPHORUS, or *Hameln Strait*, is 6 miles long, and about half a mile wide in its narrowest part, at its western entrance, where a sand-spit stretches nearly half-way across from the northern point, Cape Tokarefsky, a red and white striped buoy lying off the extremity.

LIGHTS.—A black and white pile lighthouse stands in 12 ft. water on the extremity of Cape Tokarefsky spit, and shows a *fixed bright* light, elevated 18 ft., and visible 4 miles southward between W. by N. $\frac{1}{2}$ N. and E. by S. $\frac{1}{2}$ S.

On *Larionoff Point*, on the opposite side, is a red lighthouse, showing a

JAPAN.

Glossary of Japanese Words.

JAPANESE.	ENGLISH.	JAPANESE.	ENGLISH.
Chisai	Little, small.	Midzu	Water.
Ko, as a prefix	Little, small.	Hi	Fire.
Okii	Large, great.	Tsuki	Moon.
O, as a prefix	Large, great.	O Hi	Sun.
Kuchi (makes Guchi	Mouth.	Ki	Tree.
in the compound, as		Michi	Road.
Kawa guchi)	The river's mouth.	Machi	Street.
Kawa (makes Gawa		Iye	House.
in the compound) ..	River.	Hiroi	Wide.
Yama	Mountain.	Hoso	Narrow.
Kuni	Country.	Nagai (pronounced in	
Nada	A sea.	Yedo Nangai)	Long.
Umi	The sea.	Mijikai	Short.
Seto	Strait.	No (possessive pron.)	Of.
Hana	Point.	Wa (the definite art.)	The.
Saki	Cape.	Wo (objective case)	
Misaki	A prominent cape.	Ga (indefinite article)	A or any.
Ura	Bay.	Kane (in the com-	
Minato	Harbour.	pound Gane)	Metal.
Mura	Village.	Aki-gane (red metal)	Copper.
Sima (in the Yedo		Kin	Gold.
dialect pronounced		Gin	Silver.
Shima, and some-		Tetsu	Iron.
times forms in the		Tomio	Lighthouse.
compound Jima, as		Se	A shoal.
Awa Jima)	Island.	Fukai	Deep.
Hama	Coast, shore.	Asai	Shallow.
Tei-haku	Anchorage.	Takai	High, lofty, tall.
Siwo (pronounced in		Tera	Temple.
Yedo Shiwo)	Tide.	Fune	Boat.
O shiwo, or siwo	Spring tide.	Joki sen	Steamer.
Ko shiwo ..	Neap tide.	Ho bune	Sailing vessel.
Michi shiwo ..	Flood tide.	Kuroi	Black.
Hiki shiwo ..	Ebb tide.	Shiroi	White.
Iwa	Rock.	Hana iro	Blue.
Ishi	Stone.	Ki iro	Yellow.
Kita	North.	Hatoba	Wharf, landing.
Minami	South.	Gake	Cliff.
Hagushi	East.	Take	Hill.
Nishi	West.	Ikari	Anchor.
Kaze	Wind.	Kochira ni asai ka ..	Is it shoal here?
Ame	Rain.	Kochira ni fukai ka	Is it deep here?
Yuki	Snow.	Nin or jin	Man.
Kumo	Clouds.	Onna	Woman.

North Pacific.

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JAPAN—GLOSSARY, ETC.

JAPANESE.	ENGLISH.	JAPANESE.	ENGLISH.
Kodomo	Child.	Omo kaji	Starboard.
Uchi	In, inside.	Tori kaji	Port.
Unjocho	Custom-house.	Uma	Horse.
Haru	Spring.	Ushi	Bull.
Natsu	Summer.	Niwatori	Fowl.
Aki	Autumn.	Tamago	Egg.
Fuyu	Winter.	Kamo	Duck.
Hama	Sand.	Imo	Potatoes.
Doro	Mud.	Mame	Beans.
Hashi	Bridge.	Karo	Magistrate.
Sibansho	Guard-house.	Shikwan	Officer.
Gunkan	Man-of-war.	Daimio	Noble.
Hata	Flag.	Joki sha	Railway.
Gats	Month.	Oka	Land.
Nichi	Day.	Midzu umi	Lake.

In the pronunciation of many of the above words, i and u are often almost inaudible.

Money.

The coinage now in use in Japan was adopted in the year 1871. The *Yen*, a gold coin weighing 25.72 grains troy, was constituted the fundamental unit of the system. The gold coins are 1, 2, 5, 10, and 20 yen pieces, the latter valued at £4 3s. 4d.

Silver and copper coins are as follows, the yen or dollar being used in paying duties, and in commercial transactions.

Silver.		Copper.	
1 yen	= 4s. 2d.	1 sen	= $\frac{1}{4}$ d.
50 sen	= 2s. 1d.	$\frac{1}{2}$ sen	= $\frac{1}{8}$ d.
20 sen	= 10d.	1 rin	= $\frac{1}{16}$ d.
10 sen	= 5d.		
5 sen	= 2 $\frac{1}{2}$ d.		

Weights.

Avoirdupois.		Troy.	
1 drachm	= .4695 Momme.	1 grain	= .01717 Momme.
1 oz.	= 7.5117 "	1 pennyweight	= .4121 "
1 pound	= 120.187 "	1 oz.	= 8.242 "
1 cwt.	= 13461. "	1 pound	= 98.1 "
1 ton	= 269220. "		

Measures.

1 inch	= .08378 Shakus.
1 foot	= 1.00632 "
1 yard	= 3.016086 "
1 pole	= 16.588473 "
1 furlong	= 663.539 "
1 mile	= 5308.212 "
1 geographical mile	= 6119.304 "
1 degree	= 367158. " or 28.330111 Ri.

The Measures of Capacity are as follows:—

Japanese.	Chinese.	Cubic measure.	Liquid measure.
10 Sai	= 1 Shiyaku (Choh)	= 1.1075 cubic inches.	
10 Shiyaku	= 1 Ngoō (Koh)	= 11.075 " "	or .3195 pints.
10 Ngoō	= 1 Shoō (Shing)	= 110.75 " "	or 3.195 " "
10 Shoō	= 1 To (Tau)	= 1107.5 " "	or 3.9640 gallons.
10 To	= 1 Koku	= 6.409 cubic feet.	or 4.9828 bushels.

fixed bright light, elevated 196 ft., and visible 14 miles northward between W. $\frac{1}{4}$ N. and E. $\frac{1}{4}$ S. A *red* sector of 5° is shown between N. 80° E. and N. 85° E., leading southward of Cape Tokarefski spit.

On *Pospaloff Point*, 2 $\frac{1}{2}$ miles E. by S. $\frac{1}{4}$ S. from Larionoff Point, two *fixed leading* lights are shown, which in line, bearing E. by S. $\frac{1}{2}$ S., lead through the channel between Cape Tokarefsky and Larionoff Point. The upper light is *bright*, elevated 21 ft., and visible 4 miles, shown from a white beacon; the lower light, *green*, elevated 17 ft., is shown from a green beacon.

Skrypleff Island, a round rock, about 150 ft. high, and covered with grass, lies at the eastern entrance to the Eastern Bosphorus. Two white cross beacons on its East side in line, S.S.E., lead over the reef extending N.W. of it. Vessels approaching from the northward should keep the beacons open of each other. The North point of the reef is marked by a *buoy*. The extremity of the reef extending eastward of Cape Jitkoff, towards the South end of Skrypleff Island, is also marked by a *buoy*. A sunken rock is reported to lie 7 $\frac{1}{2}$ cables N.W. $\frac{1}{4}$ N. from the North point of the island. There is a Signal Station on the island, in communication with Vladivostok.

LIGHTS.—On the summit of Skrypleff is a lighthouse, 18 ft. high, showing a *fixed bright* light, elevated 150 ft., and visible 15 miles. A *fixed green* light, elevated 164 ft., and visible 4 miles, is shown from a pyramid on the N.W. side of the island, and the lights in line, N.W. $\frac{1}{2}$ N., lead through the eastern part of the Eastern Bosphorus.

Fog Signals.—A *Bell* near the lighthouse is sounded in foggy weather; and a *Gun* will be fired from the East end of the island in answer to reports of guns heard from seaward.

PORT VLADIVOSTOK, *Golden Horn Bay*, or *Port May*, on the northern side of the Eastern Bosphorus, is an excellent harbour, where a vessel may lie quite landlocked in 8 or 9 fathoms, stiff mud. The town, on its North shore, is fast rising in importance, now that it is the head-quarters of the Russian Siberian squadron. At the western end is the naval yard. In the thick forests around, tigers, bears, wolves, boars, and deer abound. The shores are covered with oak forests, and coal appears to be everywhere present. The hills over the settlement are entrenched. In 1881 the population numbered 7,819, of whom 5,883 were Russian. The exports consist of fish, &c., for the Chinese market, the imports being provisions and manufactured goods.

In 1883 dock works were being actively proceeded with, and an hydraulic lift, capable of lifting vessels of 4,500 tons, is in course of construction.

Fresh beef can be obtained at 6d. per lb., and all sorts of vegetables. Salmon is abundant. A small supply of water can be procured from wells. Saghalin coal can be had in any quantity. There is telegraphic communication with St. Petersburg, &c.

The climate, though variable, is pleasant during summer, but it is cold and

dreary in winter, when the harbour is frozen for three or four months. May, June, and July are usually wet.

Lights.—On *Cape Goldobin*, the eastern entrance point of the port, two *fixed* lights, visible 8 miles, are shown from two red posts; the upper light, elevated 53 ft., is *red*, and the lower light, at 48 ft., is *bright*, the line of the lights in line passing through the low point of Cape Tokarefski. Two *fixed* lights, the eastern *red*, and the western *green*, are shown on the extremity of the Admiralty pier, and on its inner extremity are two *fixed bright* lights.

Fog Signal.—A large *Bell* is sounded slowly, in foggy weather, on Cape Goldobin; in answer to it from seaward, a large and small Bell will be sounded in quick succession.

There is a battery on Cape Goldobin, and a Signal Station. Buoys mark the shoal banks extending off the shores of the entrance.

According to Lieut. Onasetvich, the observation spot at Vladivostok is in lat. $43^{\circ} 6' 51''$ N., long. $131^{\circ} 53' 19\frac{1}{2}''$ E., but telegraphic determinations by U.S. officers, 1881-2, compute the longitude as $131^{\circ} 52' 44''$.

Patroclus Bay, on the northern shore of the Eastern Bosphorus, affords anchorage in its N.E. corner, in 6 fathoms. *Ulysses Cove* is a landlocked basin, westward of Patroclus Bay, its entrance being only half a cable wide. *Diomedes Inlet*, East of Cape Goldobin, affords secure and sheltered anchorage.

OUSOURI BAY, or *Napoleon Gulf*, is about 33 miles deep, and 16 miles wide, the land on its western shore being bold. The eastern shore has several indentations, encumbered with shoals.

Askold Island, *Termination Island*, the eastern point of Peter the Great Bay, is 2,000 ft. in height, about $3\frac{1}{2}$ miles long, and $2\frac{1}{2}$ miles broad. Rocks extend off its N.E. and S.E. points, and its shores are steep and rocky. Gold is reported to have been found here. *Nayezdnik Bay*, on its South side, affords anchorage at its head in 8 fathoms, open to S.W. winds.

LIGHTHOUSE.—On the South point of Askold Island is a red lighthouse, showing a *flashing bright* light, visible 25 miles seaward between E. by N. $\frac{1}{4}$ N. and N.W. $\frac{1}{4}$ W.

Fog Signals.—In foggy weather a *Bell* will be sounded; and in answer to every gun heard in the offing a gun will be fired.

Between Askold Island and *Maidel Point* is a passage 3 miles wide, *Unkofski Island*, having some islets off its North end, lying in mid-channel.

Strelok Bay, or *Port Freeman*.—Westward of Maidel Point the coast forms a bight, the centre of which is filled by the large island *Putiatin*, thus forming a strait, on the North side of which are several small bays. *Rasboinik Bay*, at the N.W. corner, affords excellent anchorage for one vessel in $5\frac{1}{2}$ fathoms, completely landlocked; and other vessels may anchor outside in perfect shelter. *Abrek Bay*, eastward of Rasboinik Bay, is exposed to winds from the S.E.

Vostok Bay, East of Strelok Bay, is open to the S.W., but small bays on

its northern shore afford sheltered anchorage. The coast is high and rocky. *Gaidamak Harbour*, on the West shore, although small, affords secure and sheltered anchorage in 5 fathoms.

America Bay, or *Hornet Bay*, is formed between Cape Sredni on the West, and Povorotny Point on the East. Capt. Forsyth, who discovered it in H.M.S. *Hornet*, in 1856, describes it as a spacious inlet, 8 miles wide and deep, carrying a moderate depth up to its head, but open to southerly winds. The *Sutchan* or *Lyons River* flows round the foot of a peculiar conical hill at the head of the bay, with a depth of 5 ft. on the bar. *Alexandrovskia*, a convict settlement, is situated on this river. Gold is reported to have been found here.

Vessels should not pass between Lisi or Fox Island and the West shore, but there is good anchorage northward of it between the island and the main. Many villages and several herds of cattle were seen. *Povorotny Point* or *Cape Kruilov*, the S.E. point of the bay, has a steep face of gray rock 200 ft. high, and southward of it is a red cliff. Some distance N.E. of the point is a hill with a red summit.

Wrangel Bay, on the eastern shore of America Bay, is 8 cables wide at its entrance, and about 2 miles deep, affording perfectly sheltered anchorage; the depths decreasing gradually from 10 fathoms at the entrance to 6 fathoms at half a mile from its head. The tides rise 2 ft. *Kosmin Bay*, about 3 miles South, affords good anchorage. *Nakhodka Bay*, on the western side of America Bay, is nearly a mile wide at its entrance, and 2 miles deep, and is perfectly sheltered from all winds, but the harbour is too shallow for vessels of large draught. There is a small Russian military settlement here. Anchorage may be had in $4\frac{1}{2}$ fathoms, soft mud.

The Coast from America Bay to St. Vladimir Bay, a distance of 150 miles, embraces mountain ranges, which do not rise higher than 3,000 ft. The coast is bordered by forests, and is thinly populated, the natives being communicative and obliging. As a general rule, along the coast of Russian Tartary, every valley which terminates on the sea-beach has its stream of excellent water. Drift-wood is generally to be found on the beaches.

The coast between America Bay and Cape Zamok, or Islet Point, was surveyed by the Russian schooner *Vostok*, in 1861. From Islet Point to St. Vladimir Bay was surveyed by H.M. ships *Actaon* and *Dove*, in 1859.

Tcheniya Bay, about 25 miles eastward of America Bay, is small but commodious, being over $1\frac{1}{2}$ mile in depth, and 1 mile wide at its entrance, with depths of 11 to 4 fathoms.

Cape Zamok, *Ostrovni* or *Islet Point*, is a bold, rocky headland, between which and St. Vladimir Bay the coast is remarkably clear of dangers, a fortunate circumstance where the navigator is so frequently enveloped in dense fogs.

Siau Wuhu Bay, *Preobrajenya*, lies 6 miles north-eastward of Cape Zamok, and affords a small but well sheltered anchorage in 5 to 6 fathoms, in its N.E.

corner. It is $2\frac{1}{2}$ miles deep, and $3\frac{1}{2}$ miles wide at its entrance between Petrova Island and *Cape Creasy*, its eastern entrance point, the latter being a bold rocky headland, 695 ft. high. From the southward, a hill 2,720 ft. high, the most elevated in the immediate neighbourhood, is a good mark to point out its position; it bears N.W. by N., $4\frac{1}{2}$ miles, from Orekhof Island, which partly shelters the anchorage. Vessels requiring a refit would find the inner harbour admirably adapted for the purpose; there is no perceptible rise and fall of tide.

An extensive plain on the North side of the outer anchorage affords pasturage for cattle, which are, however, small, but the beef is excellent. The natives ask high prices, only accepting silver in payment. The country abounds in deer. Vegetables and wood are plentiful. Water may be obtained at a stream which flows into the N.E. corner of the outer bay.

St. Valentine Bay, *Ta Wuhu*, 22 miles N.E. by E. from Cape Creasy, is quite exposed to the southward and eastward, and can only be recommended as a temporary anchorage for steamers. Its position is marked by a hill 2,370 feet high, $1\frac{1}{2}$ mile North of it; and its N.E. side by four very conspicuous cliffs. There is a village here, but no supplies could be obtained. *Castle Point*, 15 miles N.E. by E. $\frac{1}{2}$ E. from St. Valentine Bay, is a remarkable bluff, its yellow cliffs rising almost precipitously to an elevation of 1,060 ft.

Broken Head is a fine rocky promontory, 660 ft. high, $8\frac{1}{2}$ miles N.E. by E. $\frac{1}{2}$ E. from Castle Point; it is the termination of a range of hills, to the rear and northward of which is an extensive and well-watered plain, void of trees. Off the S.E. face of Broken Head is a high rock like a shark's fin. Inside the entrance of *Mosquito River*, $2\frac{1}{2}$ miles North of Broken Head, is a small sheltered basin of 3 to 5 fathoms water, too small for any but small craft. The bar had 13 ft. on it in 1859. From 8 to 9 miles N.E. of Broken Head are a line of conspicuous white cliffs. *St. Eustaphia Bay*, 4 or 5 miles beyond, is a small open bay, with exposed anchorage in 4 to 5 fathoms, sand. The coast from St. Eustaphia Bay trends E.N.E., $7\frac{1}{2}$ miles, to Low Table Point, *Mount Kruglaya*, 1,920 ft. high, lying about midway between.

Low Table Point, 20 miles N.E. by E. from Broken Head, is 120 ft. high, and is probably so named on account of the perfect level country in its immediate vicinity; it is bordered with a vertical cliff, extending 2 miles to the eastward from the base of a conspicuous round-topped mountain about 1,200 ft. high, which is especially useful in making Olga Bay from the southward, before Table Point is seen.

OLGA BAY, or *Port Michael Seymour*, in lat. $41^{\circ} 43' N.$, 11 miles N.E. by N. $\frac{1}{2}$ N. from Low Table Point, was discovered by H.M.S. *Hornet*, in July, 1856. It is open to the southward, but there is shelter from all winds in its northern part, in 10 fathoms, mud. It is frozen for four months in the year. A narrow passage, named *Brown Channel*, at its N.E. part, leads into an inner harbour or estuary, which is well adapted for careening purposes. This channel has only $3\frac{1}{2}$ fathoms in it, deepening to 6 and 7 fathoms towards the inner har-

bour, on the shores of which is a small military settlement. There is a Chinese settlement on the eastern side of the bay; the Chinese collect sea-cabbage for export. *Avakum* or *Gilbert River* flows into the N.W. angle of the port. *Petrova Rock*, with 5 ft. on it, lies 6 cables E. $\frac{1}{4}$ S. of Cape Linden on the western side of the entrance to Olga Bay; it is marked by a perch beacon.

Supplies can be had in moderate quantities only. The seine will always procure an abundance of capital fish, such as salmon and trout. A few fowls may also be procured, and small supplies of fresh butter, beef, and mutton. The watering stream flows through a valley on the eastern side of the port, near the ordinary anchorage. Wood may be obtained in any quantity.

The position of Olga Bay may be easily known when approaching it from the northward by *Brydone Island*, on the eastern side of the entrance, and the only one on this part of the coast; it appears white from seaward. Approaching from the southward, the entrance will be recognised by the opening in the land. *Brydone Island* is not distinguishable at any great distance, as, being only 325 ft. high, it looks like a cliff of *Mount Sacken*, the hill 1,341 ft. high, behind it. The outer anchorage is very exposed, and the holding ground not good. It is high water, on full and change, at 5^h 30^m; the rise is about 3 ft. The coast northward of Olga Bay for 20 miles is bold and rocky; the white chalk cliff of Cape Lunden is conspicuous.

ST. VLADIMIR BAY, in lat. 43° 54' N., 19 miles northward of Olga Bay, was discovered by the Russian frigate *America*, in 1857. Its entrance, $1\frac{1}{2}$ mile wide, and open to the East, is formed between *North Head* or *Cape Ballouzek*, 347 ft. high, and *South Head* or *Cape Watauski*, 712 ft. high, both of which, when approaching from the East or N.E., appear like islands. From thence the bay extends westward, and forms three arms, one to the North, one to the South, and the other, the smallest, to the West. The depths are about 15 to 5 fathoms in the North and South arms, but the West arm is comparatively shallow, and has a 2-ft. shoal midway in its entrance.

The South arm is well sheltered, but, as a slight swell is frequently experienced there, it can scarcely be recommended as a fit place for careening, especially with Olga Bay in such close proximity. To the South it communicates by a stream with a lake of 16 to 10 ft. water, which with little trouble might be formed into a graving dock. A stony reef extends $2\frac{1}{2}$ cables from the East side of the entrance.

There is no fixed population in this bay. A few bullocks were seen, but their owners would only part with them for sycee silver, refusing dollars. Some potatoes and wild onions were obtained. Deer are numerous.

The tides are irregular in St. Vladimir Bay. It is high water, on full and change, at 1^h, and the range is about 2 ft.

Approaching from the southward, *Pinnacle* and *Chetyrek Points* are the only remarkable features, the former having a sharp needle rock at its extreme.

Chetyrek Point, $3\frac{1}{2}$ miles S.S.W. of the South Head, is formed by three rocky summits.

The COAST from St. Vladimir Bay trends in a N.E. by N. direction to Barracouta Harbour, in $49^{\circ} 2' N.$, then N. by E. to Castries Bay, and is free from apparent danger. Its outline was but imperfectly known until 1855, when H.M. ships *Sybilie* and *Barracouta* sailed along it, and determined the following points and anchorages. This coast was surveyed by the Russian Colonel Bolschef, in 1875, an undertaking of great difficulty and hardship.

Shelter or Oprichnik Bay, in $44^{\circ} 30' N.$, affords shelter from N.E. winds. Good water can be obtained in a river a cable wide, with a bar at its mouth, and a depth of 9 ft. within. It affords a supply of fish.*

Sybilie or Platoon Bay, in $44^{\circ} 44' N.$, affords shelter from S.S.E. winds. Its entrance is remarkable from having on either side some prominent pinnacle rocks, high and isolated. The bay is closed by a broad valley, through which some streams run and form a small river, which empties itself into the bay.

Pique Bay, in lat $44^{\circ} 46' N.$, has good shelter from N.E. and easterly winds. The best anchorage is in 5 fathoms, with the point bearing S.E. by E. Cattle may be obtained at this anchorage.

Bullock or Ternei Bay, in $45^{\circ} 5' N.$, affords but bad anchorage. Bullocks and fowls can be procured, but with difficulty.

Luké or Shantz Point, in $45^{\circ} 22' N.$, is high, bluff, and woody. *Cape Disappointment*, in $45^{\circ} 47' N.$, has rocks extending a cable from it.

The coast to the northward, in the Gulf of Tartary, is described previously, pp. 761—764.

* This coast is described in Mr. Tronson's Voyage of the *Barracouta*, 1859, p. 326, &c.

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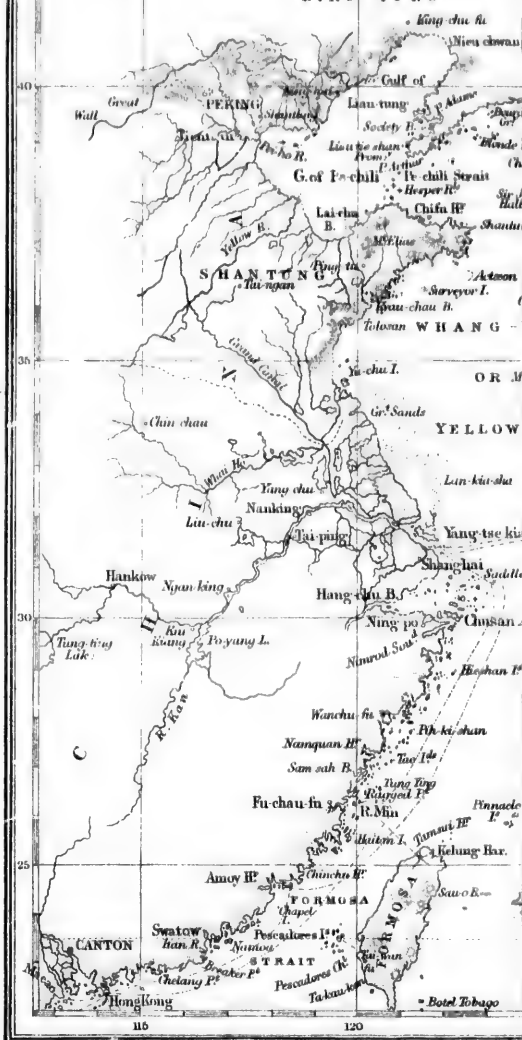
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CHAPTER XI.

THE JAPANESE ARCHIPELAGO.

THE celebrated and long mysterious traveller, Marco Polo, was the first to announce to the western world the existence of the rich and powerful island of *Xipangu*, now known to be Japan. In 1542 a Portuguese, Mendes Pinto, was cast by a storm on its shores, and a Portuguese settlement from Malacca was soon afterwards made on Kiusiu. In June, 1588, some citizens of Rotterdam fitted out a small fleet of five ships to trade in the Indian Archipelago, and injure, as much as possible, the commerce and power of Spain. Among several Englishmen in this fleet, were William Adams, of Gillingham, near Rochester, and Timothy Shotter, who had accompanied the famous Cavendish in his circumnavigation. The venture was pre-eminently unfortunate. Only one ship, and that the smallest, the *Joyous Message*, commanded by Siebold de Weert, returned to Holland. Two of the others were destroyed, and the fourth, in which were these two Englishmen, reached Japan a mere wreck. The crew were taken prisoners; and, after some confinement, Adams was taken into the confidence of the Emperor; the rest departed. He was raised to great honours; became of first importance in the political and commercial affairs of the empire; but did not succeed to the extent of his intentions, having gained privileges only for the Dutch, who have studiously avoided mention of his part in their establishment. Some extensive privileges were also granted, at his instigation, to the English East India Company, to establish a factory at Firando.*

As is well known, the only port allowed to be open to foreigners (and this permission was limited to the Dutch and Chinese) was the Port of Nagasaki, or rather for the Dutch, the Island of Dezima, lying before it. But the Japanese maintained a rigid exclusiveness, and but little was known to Europe about the country. Without enumerating the older authors, the principal work on Japan was a collection from the notices of the Dutch presidents, by Dr. Ph. Fr. van Siebold, who visited the country in the period between 1823-30, a magnificent work, worthy of any nation.

* The first English who visited it were with Capt. Saris, who came to the relief of Adams from England, in 1611, arriving at Firando June 9th, 1613.

The events of later years have marvellously altered the relations between Japan and western civilization. The various attempts at obtaining some admission into Japanese affairs, made prior to 1853, cannot here be enunciated. But in that year, July 8th, Commodore Perry, U.S.N., appeared off the entrance to Yedo Bay, with two large steam frigates and two sloops of war. He ostensibly sought at first only to abolish the barbarous Japanese laws, which consigned shipwrecked seamen to death, and their vessels to destruction. The steady resistance to any intercourse, overawed by the presence of this formidable force, gradually gave way, and some concessions were granted before the departure of the fleet, which left with a promise, or menace, from Commodore Perry, that he intended to return for a more definite answer with a "larger fleet" in the following year. Accordingly, on February 12th, 1854, a squadron of nine war vessels appeared in the Bay of Yedo, and after skilful negotiation a treaty of friendship was concluded between the Tycoon and the United States, and permission was granted to locate a consul at Simoda, an insignificant place at the South extreme of the Idsu Peninsula, on the West side of Yedo Bay.

The second stage of this international negotiation was reached by Mr. Harris, the U.S. diplomat, who, by unrelenting zeal, contrived to enter Yedo at the end of 1857, not to leave it till April, 1858, with the treaty of commerce framed. This great step was followed by similar concessions being granted to the principal European powers; and that with Great Britain was ratified at Yedo, July 11th, 1859. After all these apparent victories, it was discovered that these treaties were illegal, having been made with the Tycoon of the period, whereas it should have been ratified by the Mikado, but this was remedied by the appearance of the allied fleet from China, and the subsequent full recognition of the rights of the external world to trade at various ports. Of the subsequent troubles nothing can be said here. The works of Sir Rutherford Alcock, Capt. Sherard Osborn, R.N., &c., &c., will supply all that can be required.

The empire of Japan is composed of four large islands, Kiusiu, Sikok, Nipon,* and Yezo, and numerous smaller islands, said to be above 3,800 in number, together extending about 900 miles, North and South, with an area of about 160,000 square miles. Nipon, or Honshiu, the largest and most important of these, and that which gives its name to the whole empire, is more than 700 miles in length, N.E. and S.W., and its breadth varies from 50 to 150 miles. South of Nipon, and separated from it by a narrow channel, is Kiusiu. Lying N.E. of Kiusiu, and eastward of the South extreme of Nipon, is the island of Sikok, about 130 miles in length. It is separated from Kiusiu by the Boungo

* *Nipon* is applied in Japan to the whole empire. In the two words of the Chinese characters which compose it, *Jih Pun*, it means the place of the rising of the sun. The Japanese soften the first letter into *n*, and so make it *Ni Pun*, the Dutch spelling it *Jeh Pun*, their *j* corresponding with our *y*. The English, giving the harsher sound to *j*, call it Japan; so *Jeddo* should be pronounced *Yedo* for the same reason, and is hereafter spelt so.

Channel, and with Kiusiu and the western part of Nipon forms a basin or inland sea named Seto Uchi. North of Nipon, and separated from it by the Strait of Tsugar, is the large island of Yezo, a conquest and colony of Japan. Its form is that of an irregular triangle.

The Japanese islands are exceedingly broken and mountainous, with numerous peaks, of which Fusi yama, in lat. $35^{\circ} 21' 5''$, long. $138^{\circ} 43'$, is the principal, rising to an active volcano, the summit of which is 12,450 ft. above the sea. There are no rivers of any great magnitude, but numerous lakes exist.

The chief towns of Japan are now all joined with each other and with Europe by electric telegraph; railways are springing up near the chief ports, and coal is being worked on European principles. A good indication of the progress made by Japan in the last few years is afforded by the rapid lighting of the coast. Of the numerous lights now exhibited not one was shown previous to the year 1869, a few coal fires only marking the coast at night. In 1882 the population of the empire numbered 36,358,994, and in 1884 there were 2,382 European residents in the country, 1,094 of whom were English.

In 1883, 946 foreign vessels, with a total tonnage of 1,098,772, entered the various treaty ports, of which 589 vessels, with a total tonnage of 724,355, were British. The imports, chiefly consisting of cotton and woollen goods, sugar, kerosine, and metals, in 1883 amounted to £5,826,862 in value, of which £3,184,457 came from Great Britain and the Colonies. The exports for the same year, chiefly silk (including eggs and cocoons) and tea, amounted to £7,456,055 in value, of which the United States took £2,759,967, and Great Britain £1,183,059. The coasting trade is nearly all in the hands of the Japanese, who have several shipping companies, including a line of steamers running to Shanghai and Hong Kong.

Treaty Ports.—The following are the ports opened to British subjects by treaty, between Her Majesty the Queen of Great Britain and Ireland and the Mikado of Japan:—Kanagawa (including Yedo and Yokohama), in the Gulf of Yedo; Nagasaki, on the West coast of Kiusiu; Hiogo (Kobe and Oösaka), in the Isumi nada (eastern part of the Inland Sea); Niigata, on the N.W. coast of Nipon; and Hakodate, on the South coast of the Island of Yezo. Of these, Kanagawa is by far the most important.

Pilots.—Pilot boats are painted black, with their number on the large sail, and when licensed pilots are on board will fly a pilot flag, and by night carry a bright light at the mast-head, and will show a flashing light every 15 minutes. Vessels requiring a pilot should hoist the national flag at the fore-mast head, or the letters P.T. of the International Code. By night a green light should be shown every 15 minutes, or a bright light, at intervals of about a minute, over the side on the upper deck.

Climate.—The climate of Japan varies considerably between its southern and northern extremes, the latter having almost a Siberian climate. Speaking generally, the summer is short, damp, and hot, and the winter long, com-

paratively cold, and fine. Autumn and spring are the most pleasant seasons in southern Japan. Rain is frequent throughout the year, but altogether it is a healthy climate for Europeans.

The high barometer indications and low temperatures which characterize the winter in Japan are determined by the predominance of cold northern winds. The prevailing winds in winter are, in Hakodate, N.W. and West; in Niigata, South, S.W., West, and N.W.; in Tokio, North and N.E.; in Nagasaki, North and N.W. From April or May until September blow warm southern winds. On the Sea of Japan they are chiefly S.W. winds; but at Yokohama, and all the places bordering on the Pacific, South winds predominate. This summer monsoon does not prevail with at all the same strength and regularity as the cold northern winds of winter. Calms are frequently interchanged with light variable winds.—*Professor J. J. Rein.*

The following observations are made by Van Siebold:—"In speaking of ice, frost, and snow, within 32° of the equator, we should consider the geographic position of the Japanese Islands, and cite an observation which has been more than once made, and at last confirmed by Alex. de Humboldt. The eastern part of Europe, and the immense continent of Asia, are vastly colder, under the same latitude, than western Europe, making allowance for the greater or less elevation above the sea level. The climate of islands being much milder than that of continents, it can scarcely be comprehended that the temperature should be lower in Japan than those European countries under the same latitude. But the cause of this contradiction is found in the low temperature of Asia, which, surrounding the Japanese and Kurile Islands on the West and North, has a very decided influence on their climate. From the proximity of the continent, and the winds blowing off that coast during a portion of the year, the cold arises which prevails in Japan, particularly in the North and N.W. Thus in lat. 32° N. the thermometer descends on the coast to 30° and 29° Fahr. It freezes to several lines in thickness, and snow falls and remains on the ground for several days. In lat. 36° the lakes, as those of Suwa on the Sinano, are covered with a bed of ice, which, between 38° and 40° , becomes thick enough for the river to be crossed on foot. In the island of Tsushima (lat. $34^{\circ} 12' N.$, long. $129^{\circ} 12' E.$) rice will not grow; near Matsumae, in the Island of Yezo, wheat returns but a very poor harvest; and on Cape Soja (lat. $45^{\circ} 30' N.$, long. $141^{\circ} 55' E.$) the wild Ainos, a vigorous race, are obliged to retire into caverns, to preserve themselves from the intolerable rigour of winter.

"On the other hand, the S.E. and eastern sides, protected from the freezing winds of Asia by high chains of mountains, which traverse these great Islands of Kiusiu, Sikok, and Nipon, in a direction parallel to the continent, have a more fertile and more temperate climate. In those parts of the country between lat. 31° and 34° , the palm, the banana, myrtle, and other plants of the torrid zone, are found. In some parts the sugar-cane is successfully cultivated,

and they gather two rice harvests each year. The environs of Sendai, a city in lat. $38^{\circ} 16' N.$, long. $140^{\circ} 53' E.$, produce this grain in such abundance, that, notwithstanding their northern position, they are in reality, as they are called, the granaries of Yedo, the most populous city of the country.

"But it is more particularly in the rigorous season, which lasts from the commencement of January to the end of February, that this difference between the western and eastern shores of Japan becomes most remarkable. At Dezima (Nagasaki), for example, in lat. $32^{\circ} 45' N.$, long. $129^{\circ} 52' E.$, the thermometer marks 45° Fahr.; while at Yedo, in lat. $35^{\circ} 40'$, long. $139^{\circ} 48' E.$, it rises to 56° ; so that the position of the capital, more easterly by $9^{\circ} 56'$ than Nagasaki, raises its temperature higher by 11° , although it is 3° nearer the pole. Thus in the two months of winter in which these observations were made, the coasts facing the Asiatic continent were exposed for thirty-seven days consecutively to the freezing winds from N.W. and North. This circumstance explains, besides, why the white mountain (*Siro yama*), which is on the western coast of Nipon, in lat. $36^{\circ} 10'$, is covered with perpetual snow at 8,200 ft. above the sea; and why *Fusi yama*, at the eastern extremity of the island, with its summit at 12,450 ft., remains without snow for months together.

"During the hot weather in July and August, when the winds blow from South and S.E., this disproportion in the temperature disappears, and the mean height of the thermometer for this season is 79° at Dezima, and 76° at Yedo. On the South and S.E. coasts, then refreshed by these winds, it hardly exceeds 85° ; nevertheless in the South and S.W. parts of Kiusiu, and chiefly in the bays sheltered from the breezes, it often rises to 90° and 98° , and sometimes even to 100° ."

In the above description no mention is made of the Kuro Siwo, which considerably influences the climate of the coasts along which it flows.

At Hakodate the climate in winter is variable. In the winter of 1859—60, the greatest depression of the thermometer was 12° . The character of the winter season is uneven, and acts prejudicially on the health, in consequence of the great variability of the atmosphere, thaws and sharp frosts alternating. North-westerly winds blow for four months, and snow fell in the winter of 1859 daily for six weeks. Sir R. Alcock says the winter is almost Siberian, with long continued and heavy falls of snow, the thermometer standing many degrees below zero.

Storm Warnings are exhibited at the principal ports as follows:—For storm approaching, the direction of which is not precisely known: A ball, or at night a red light. Storm from northward: One cone with apex up, or by night three red lights, one above and two below. Storm from southward: One cone with apex down, or by night three red lights, two above and one below.

Fogs are very prevalent on the coasts of Japan, especially in the northern parts. In June and July fogs occur frequently in Korea Strait; farther to the

North they envelope the coasts of Manchuria till the middle of July. Thunderstorms are neither frequent nor violent.

Earthquakes.—The whole region of the Japanese Islands is volcanic, and many of the eruptions are fraught with extreme danger to ships. At Yedo, one occurred in August, 1783, exceeding in its horrors and wide-spread desolation that of Lisbon. Another occurred at Yedo on November 10th, 1855, which is said to have caused the destruction of 100,000 dwellings and 54 temples, and the death of 30,000 persons. In 1854 the town of Simoda was reduced to ruins. Simabara, in Kiusiu, is also a locality of terrible earthquakes, one of which is said to have altered the whole feature and coast line of the neighbouring province.

The Japanese Current, or Kuro Siwo, as it is called by the Japanese in one point of its course, is an immense stream which rushes past the southern coasts of the Japanese Archipelago towards the N.E., and is exactly analogous to the Gulf Stream in the North Atlantic. It has been observed by every voyager in these regions; and, like the Atlantic stream, may be traced to a great distance to the eastward, and evidences of this drift have been frequently found on the American coast, as in the remains of junks, or of these vessels with their crews being drifted on to the American territories, as previously related.

But the Pacific current differs from the Atlantic stream in not being confined in a narrow channel at its outset, and in the strongest part of its course. Hence its velocity and direction are not so constant, and some great variations in the current have been experienced, and these, too, without any apparent cause. Thus there can be no dependance placed on its rate or direction, and inshore it is certainly controlled or altered by tidal action. In a later part of this work this remarkable stream will be noticed more at length, in the section specially devoted to currents.

The Japanese Archipelago has never been properly surveyed. Some portions have been minutely examined, especially the vicinities of the treaty ports where European commerce has hitherto been allowed. In addition to the surveys made by the officers of the American squadron in 1853-4, and the British fleet in 1863, there are various portions derived from the surveys of Commander J. Ward, R.N., in the *Rifleman*; of Commanders Brooker and Aldrich, R.N., in the *Sylvia*; of Lieut. Carpenter, R.N., in the *Maggie*; of Lieut. Hoskyn, R.N., in the *Flying Fish*; and especially of Commander C. Bullock, R.N., in the *Serpent*; and of Capt. St. John and Lieut. Pearce, R.N., in the *Sylvia*.*

All these and others have been connected together by a most remarkable

* Among the more recent and numerous books of travel, &c., relating to Japan, we may mention "New Japan," by Mr. Samuel Mossman, 1873; "Notes and Sketches from the Wild Coasts of Nipon," by Capt. H. C. St. John, H.M.S. *Sylvia*, 1880; "Unbeaten Tracks in Japan," by Miss I. L. Bird, 1880 and 1886; "Japan," by Professor J. J. Rein, 1884, a standard work on the country and its people; and "A Handbook for Travellers in Central and Northern Japan," by Mr. E. M. Satow and Lieut. A. G. S. Hawes, 1884.

map. During the political negotiations this perfect representation of the empire was delivered to our representatives, and it was found to be a regular trigonometrical survey of 6 miles to an inch, and so accurate that, when tested by the surveyors, it was found that very great reliance could be placed on it. Such a geographical work deserves especial mention.*

The ensuing brief directions are principally taken from those given in the China Pilot; and, though belonging to various authors, have been collected, arranged, and amplified by Commanders C. Bullock and F. W. Jarrad, R.N. These directions, here much condensed, commence with the *southern* extremity of the Archipelago, and, although this is a different arrangement to the preceding portion of this work, it has been followed here, as it is thought more convenient than proceeding from the northward.

ISLAND OF KIUSIU.

The word Kiusiu, according to Kämpfer, signifies "country of nine," in reference to its division into nine larger provinces. It is about 180 miles in length North and South, and about 80 miles in average breadth. It is separated from Nipon by the Simonoseki Channel, which at its western entrance is only about half a mile in width. The strait which separates it from Sikok also is contracted to 7 miles broad at one point. The Strait of Van Diemen forms its southern boundary, and the Strait of Corea, or Korai, is on the western side.

VAN DIEMEN STRAIT separates Kiusiu from a group of volcanic islands, which, extending in a S.S.W. direction, connect this extremity of Japan with the volcanic ranges of the Philippine Islands, and will be described in a future Chapter. *Nana shima no seto*, or Van Diemen Strait, separates Kiusiu Island from the islands Kuro sima, Iwoga sima, Take sima, Make sima, and Tanega sima, on the S.W. and South; it is clear of dangers, and consequently safe, but a spot of 8 fathoms was reported by H.M.S. *Rosbuck*, in 1859, to lie about 2½ miles S.S.W. of Satano misaki, the South point of Kiusiu. Making this strait from the westward, Kuro sima, 2,028 ft. high, the active volcano Iwoga sima, 2,331 ft. high, and the lofty cone-shaped mountain *Okaimon dake* or *Mount Horner*, 3,020 ft. high, on the West side of the entrance to Kagosima Gulf,

* There is a sad story in connexion with this map, which is related in Commodore Perry's "Narrative," page 88. The story is thus told by a modern writer on Japan; "Von Siebold had been with Colonel Struier, the Dezima chief, to Yedo; the Japanese astronomer, *Takahasi Lakusaimon*, had, in violation of the law, furnished him with a copy of a recently made map of Japan. The draughtsman who made the copy having become, from some cause, offended with the astronomer, denounced him to the authorities. An investigation followed, which lasted a year. Von Siebold was banished from Japan; and *Takahasi*, and the draughtsman who accused him, both committed suicide." This occurred prior to the commencement of the American Expedition in 1853.

form conspicuous landmarks. The only drawback to the navigation of this channel is the heavy weather and thick atmosphere usually met with off Satano misaki; the Japan Stream setting strong to E.N.E. through the strait at all times causes the latter to become a serious disadvantage, which is, however, somewhat lessened by the light now exhibited on the above cape. Vessels are cautioned against passing southward of Iwoga sima, as there are detached rocky shoals and very uneven bottom in that direction.

SATANO MISAKI, or *Cape Chichakoff*, the southern point of Kiusiu, is bold and rocky, rising steeply to a wooded range 750 ft. in height, the mountains at the back, from which it is a spur, rising to a considerable elevation, and culminating in a peak 2,948 ft. high. A small islet lies $1\frac{1}{2}$ cable southward of the cape, and several detached rocks also lie close around it. This cape is well known to vessels trading to Japan, and has attained celebrity from the fact that almost constant bad weather is experienced in its vicinity, violent gales with a thick murky atmosphere rendering the passage through Van Diemen Strait at times somewhat perilous. Heavy tide races occur off the cape.

LIGHT.—On the island off the cape is a white iron lighthouse, 32 ft. high, showing a *fixed bright* light, elevated 200 ft., and visible 21 miles seaward between N.E. by E. $\frac{1}{2}$ E. and N.W. by N. $\frac{1}{2}$ N., through East, South, and West. Lat. $30^{\circ} 58' 30''$ N., long. $130^{\circ} 40' E.$

At 5 miles northward of Satano misaki is *Tatsume no hana*, a bold and rocky point, $1\frac{1}{2}$ mile N.E. of which is a small bay, in which anchorage may be obtained in 12 to 13 fathoms. About 2 miles beyond this is another indentation, with anchorage in 9 to 10 fathoms, sand, the best anchorage in this locality.

KAGOSIMA GULF is an arm of the sea, 35 miles in length, and from 5 to 10 miles in breadth, running in a northerly direction into the southern part of Kiusiu. It is surrounded by high mountains, except to the North. *Kami se*, a rock awash at low water, lies in the middle of the entrance, at 4 miles N.N.W. from Tatsume no hana. At 25 miles within its entrance the large inhabited island of *Sakura*, 3,636 ft. high, and 4 to 5 miles in diameter, nearly fills the head of the gulf, with deep channels on both sides leading into an inner gulf, or spacious harbour, 6 miles by 9, and quite landlocked.

Yama gawa, a small harbour on the West side of the entrance to the gulf, is the crater of an extinct volcano. Its North part opens East to the sea by a funnel-shaped passage a quarter of a mile in length, but only $1\frac{1}{2}$ cable wide at its inner part, formed between a shoal bank extending 1 mile from the South shore, and a reef extending $3\frac{1}{2}$ cables from the North shore. There is $3\frac{1}{2}$ to $4\frac{1}{2}$ fathoms over the bar, with a patch of 2 fathoms in the centre. No vessel should attempt to enter in bad weather, although a vessel of 1,000 tons may lie there at anchor, or moored to the shore. Inside the harbour the water is deep. Supplies of fish, fowls, and fruit may be procured from the inhabitants. It is high water, on full and change, at $7^h 32^m$; springs rise $9\frac{1}{2}$ ft.

Kasa she, or *Waters Rock*, two dangerous sunken rocks, the outer of $2\frac{1}{2}$ ft.,

and the inner of 9 ft. water, lie close together, E. $\frac{1}{2}$ N., 7 cables from Oo saki, the North entrance point of Yama gawa, with a depth of 6 fathoms between.

At 4 miles northward of Oo saki is *Tsiring sima*, nearly a mile from the West shore, with which it is connected by a reef; it is from 150 to 200 feet high. On the eastern shore, opposite, *Racehorse Shoal* extends about $2\frac{1}{2}$ miles off, leaving a passage about 3 miles wide. From hence the gulf extends 17 miles northward to Sakura Island, with a breadth of about 10 miles.

In the southern part of the channel westward of Sakura is *Kami she*, or *Parker Shoal*, dry at low water; temporary anchorage may be obtained on its S.W. side. A fort stood on this shoal in 1863. *Okiko* and *Karasu Islands* lie close off the S.W. and West part of Sakura. Several islets and rocks lie off the N.E. side.

KAGOSIMA.—On the western shore, facing Sakura, stands the city of Kagosima, formerly the fortress of the Daimio, Prince of Satsuma. Battery Point, to the South of the city, is low, and has a spit extending from and around it to 2 cables, very steep at its edge; a shoal also fills the bay North of this point. Off the centre of Kagosima, in front of the Daimio's castle, is an inner harbour or large camber, gained by entrances between five forts of masonry, which have deep water close up to them; this castle cannot be seen from the gulf. There is a cannon-shot foundry here, worked by Japanese, and the town is in telegraphic communication with Nagasaki.

Two small rivers disembogue, one on the North side of the city with long spits off its points of entrance; the other, flowing through the southern part of the city, falls into the shallow bay just North of Battery Point.

Light.—On the North end of the breakwater fronting Ben-ten Fort, a *fixed red* light, elevated 45 ft., and visible 6 miles, is shown from a staff.

Anchorage.—The extreme depth of the water in the gulf renders anchorage anywhere very difficult; the fleet found indifferent anchorage close to the beach on the western shore, near the Seven Rocks, 4 or 5 miles South of Kagosima.

The western shore of Sakura is very bold, but anchorage in from 12 to 25 fathoms may be found E. $\frac{1}{2}$ N. of the castle of Kagosima, very close in. In an easterly gale there is danger of driving off the bank into very deep water, and having to slip the cables. Anchorage also may be obtained generally in the southern part of the channel, in from 21 to 24 fathoms. At the head of the gulf on the small bank off Hamaichi, and North of Ko sima or Havock Islands, there is anchorage in from 7 to 9 fathoms.

The **COAST** for 140 miles to the north-eastward, comprising the whole of the East coast of Kiusiu is comparatively unknown. The land is generally high and wooded.

Odomari Bay, 2 miles eastward of Satano misaki, has an average width of 3 cables, and affords excellent shelter, for only two steam vessels, from northerly *North Pacific*.

and north-westerly winds. A few fowls may occasionally be obtained from the village. *Kanon Saki*, in $31^{\circ} 10' N.$, is a bold headland, projecting slightly from the general line of the coast.

He saki, a prominent, bare point, 786 ft. high, is about $10\frac{1}{2}$ miles N.E. or *Kanon saki*, and at 12 miles farther is *Toi no misaki*, a steep, bluff headland, 982 ft. high, with three remarkable knobs of trees on its summit, as seen from the N.E. Several detached rocks lie off it. It is proposed to erect a lighthouse on this point. Between these two points is the entrance of *Ariaki no ura*, or *Tasman Bay*, which extends about 11 miles to N.W., but affords no protection from winds between South and East; excellent shelter may be obtained from hard northerly and westerly gales anywhere off the N.W. shore, in 5 to 7 fathoms.

Oprey Breakers, reported, in 1864, in lat. $31^{\circ} 27' N.$, long. $131^{\circ} 40' E.$, have not since been seen. It is believed that they were caused by the current overfall.

Aburatsu Harbour, about 13 miles N. by E. of *Toi no misaki*, is the only safe anchorage on the S.E. coast of *Kiusiu*. It is formed by *Oo sima*, and may be entered by vessels of any size either northward or southward of that island. Vessels of moderate size can anchor in $3\frac{1}{2}$ to 4 fathoms off the town; large vessels can anchor in 9 to 10 fathoms, half a mile westward of the North part of *Oo sima*.

LIGHTHOUSE.—On the South point of *Oo sima* is a white lighthouse, 32 feet high, showing a *bright light*, revolving every half minute, elevated 287 ft., and visible 24 miles, between N. by E. and N.W. by N. (315°).

Kayeta or *To saki*, or *Cape Cochrane*, in lat. $31^{\circ} 47'$, is a low hilly point, terminating in a wooded knob 290 ft. high. Rocks extend off the coast between it and *Abaratsu*, and a reef extends 3 cables N.E. of the cape. *Nelly Rocks* (*Odo no se*), reported, in 1863, by the British barque of that name, have 1 to 3 fathoms water over them, and extend three-quarters of a mile North and South; their central part being $3\frac{1}{2}$ miles East of *Cape Cochrane*. The coast from *Kayeta saki* to *Kuma sima*, a distance of 38 miles, is a nearly straight sandy beach, broken only by the mouths of a few rivers.

Kuma sima or **Hoso sima Harbour**, in lat. $32^{\circ} 23'$, is a secure and well sheltered anchorage for a large number of vessels. It is a narrow creek, the entrance open to the N.E., and extending about a mile to its head. During typhoons the winds at East and S.E. are usually the strongest; *Hoso sima Harbour* would thus afford shelter during the season when those storms occur. A vessel in distress might safely be beached at the head of the bay. Anchorage may be obtained in 6 fathoms immediately on opening out the village.

From hence the coast trends to the N.E. by N. to *Sura saki*, a bold bluff, the eastern point of *Kiusiu*. Here the coast turns to N.N.W. to *Sagano saki*, the N.E. point of *Kiusiu*. All this coast is much indented, and off its northern part lie numerous islands. *Inokushi Harbour*, in lat. $32^{\circ} 46'$, long. $131^{\circ} 55'$,

is said to be a secure anchorage in all weathers. *O Idi sima Harbour*, a perfectly secure anchorage in $32^{\circ} 59' N.$, lies between *O Idi sima* and the mainland, with 8 fathoms, mud bottom. *Sagano saki* is a nearly detached mass of land, triangular in shape, and 650 ft. high, with a village on the narrow neck connecting it with the main land. Numerous islets and rocks lie off the coast.

The **SOUTH COAST** of **SIKOK**, from *Isa saki* at the eastern entrance to the Boungo Channel, to *I sima* at the western entrance to the *Kii Channel*, is also as yet unsurveyed. This coast is about 150 miles in extent, and is divided by the projecting peninsula, of which *Murato saki* is the extreme point, into two bights, that to the westward being the deeper. It is very broken in outline, with several deep indentations.

Isa saki, the southern extreme of *Sikok*, is a bluff headland, at the extremity of a peninsula having two peaks about 1,500 ft. high. *Simidsu* is an excellent landlocked harbour, for small vessels, 4 miles N.W. of *Isa saki*, with a depth of 5 to 6 fathoms.

Susaki and Nomi Harbours.—The coast of *Sikok*, between *Ootru saki* and *Ko sima no hana*, forms a deep bight $3\frac{1}{2}$ miles wide, and 4 miles in depth, forming two inlets extending to the northward and eastward, in which are the villages of *Susaki* and *Nomi*. *Susaki* is situated on the western low shore of the northern inlet, in which is excellent sheltered anchorage. The eastern shore of the inlet is steep-to, and should be kept on board. The usual anchorage is in 7 fathoms, with the low point of *Susaki* bearing S.W. $\frac{1}{4}$ S. The battery just below the temples is in lat. $33^{\circ} 23' 18'' N.$, long. $133^{\circ} 17' 48'' E.$

Nomi Harbour, the eastern inlet, is secure and spacious, formed between two peninsulas, the southern one having several islands and rocks off it. The western chain, of which *Naka no sima* and *Hey sima* are the largest, protects the anchorage, which is in 10 fathoms, $2\frac{1}{2}$ cables off the village, from southerly winds. Vessels entering either harbour should pass about half a mile westward of *Hey sima*, and in entering *Nomi Harbour* should keep the northern shore on board. The southern chain of islets and rocks extends to the wooded islet *Ko sima* in a S.S.E. direction. A rock, which uncovers, lies $1\frac{1}{2}$ cable south-westward of *Ko sima*; another at $3\frac{1}{4}$ cables from its South point; and *Breaker Rock*, which uncovers at low water, lies S. by W. $\frac{1}{4}$ W., $1\frac{1}{2}$ mile from it.

Ura-no-Utsi, 9 miles eastward of *Nomi*, is barred across the entrance by a sand-bank. Some shelter may be obtained in S.W. winds, in 4 to 8 fathoms.

Wurato or Kotsi Inlet has a narrow and difficult entrance, but vessels of 15 feet draught may enter at springs. The outer anchorage, in 7 fathoms, sand, cannot be recommended. On the South point of entrance, in lat. $33^{\circ} 30' N.$, long. $133^{\circ} 36' E.$, is a white lighthouse, 31 ft. high, showing a *fixed bright light*, elevated 102 ft., and visible 10 miles, between N.W. $\frac{1}{4}$ N. and S.W. by S. $\frac{1}{4}$ S. (247°), but obscured by land between N. 24° E. and N. 29° E.

BOUNGO CHANNEL, which separates the islands *Kiusiu* and *Sikok*, and

is the S.W. entrance to the Seto Uchi, is from 7 to 20 miles broad, and its shores are singularly broken into projecting peninsulas. It was passed by Kämpfer and Thunberg, and they speak of the thousands of islands with which it is encumbered. The allied squadron, under Admiral Sir A. L. Kuper, entered it in August and September, 1864, and found it free from danger, and the Japanese charts correct. Caution, however, is requisite in approaching the shores. During spring tides the stream often sets through the northern entrance with great velocity (6 knots), and then during the flood stream, which makes to the northward, a heavy tide-race forms off Mi saki.

Okino sima, a large island forming the eastern point of the South entrance to this channel, is 1,150 ft. high, and may be seen in clear weather at 35 miles. To the northward of it, also towards Hima sima and towards the main land to the eastward, the space appeared to be rocky foul ground.

Midsu-no-ko or **Euryalus Rock**, named after H.M.S. *Euryalus*, is a small rocky islet, 60 ft. high, lying in the middle of Boungo Channel, 25 miles N.W. of Okino sima. It is surrounded by rocky shoals, some above water, to the distance of half a mile. It occupies a most excellent position for a lighthouse.

Takanaba, the island lying nearly in the middle of the northern entrance of the channel, has two small rocks above water, at 2 cables N.W. of it, and reefs extend nearly half a mile off in several places. The passage on the West side, between it and Sagano saki, is encumbered with reefs, but the eastern passage is free from danger. *Mi saki*, the narrow sharp point terminating the remarkable peninsula which forms the western point of Sikok, is 150 ft. high, and has off it two small islets.

THE SETO UCHI OR INLAND SEA.

The great Inland Sea of Japan, called by the Japanese Seto Uchi (Inner Strait), is enclosed between the S.W. coast of Nipon, which entirely bounds it on the North and East, and the Islands of Kiusiu and Sikok, which bound it on the West and South. It extends somewhat in an East and West direction, 240 miles in length, with a breadth varying from 3 to 30 miles. It has six divisions called *nadas* or seas, taking their names generally from the provinces, the coasts of which they wash; thus, the western part of the sea, as far as the Boungo Channel, is called the Suwo *nada*; and, proceeding East, we have in succession, Iyo *nada*, Misima *nada*, Bingo *nada*, Harima *nada*, and, lastly, Isumi *nada*, sometimes called the Gulf of Oösaka.

The Seto Uchi was first navigated by H.M.S. *Cruizer*, in 1859, and it was passed throughout by the allied fleet under Admiral Sir A. L. Kuper, in 1864. It contains upwards of 300 islands and rocks, with numerous shoals and dangers, and has a sea-board of nearly 700 miles, on which are situated numerous villages and large towns, and several of the provincial capitals. It abounds with safe and convenient anchorages, and communicates with the Pacific by

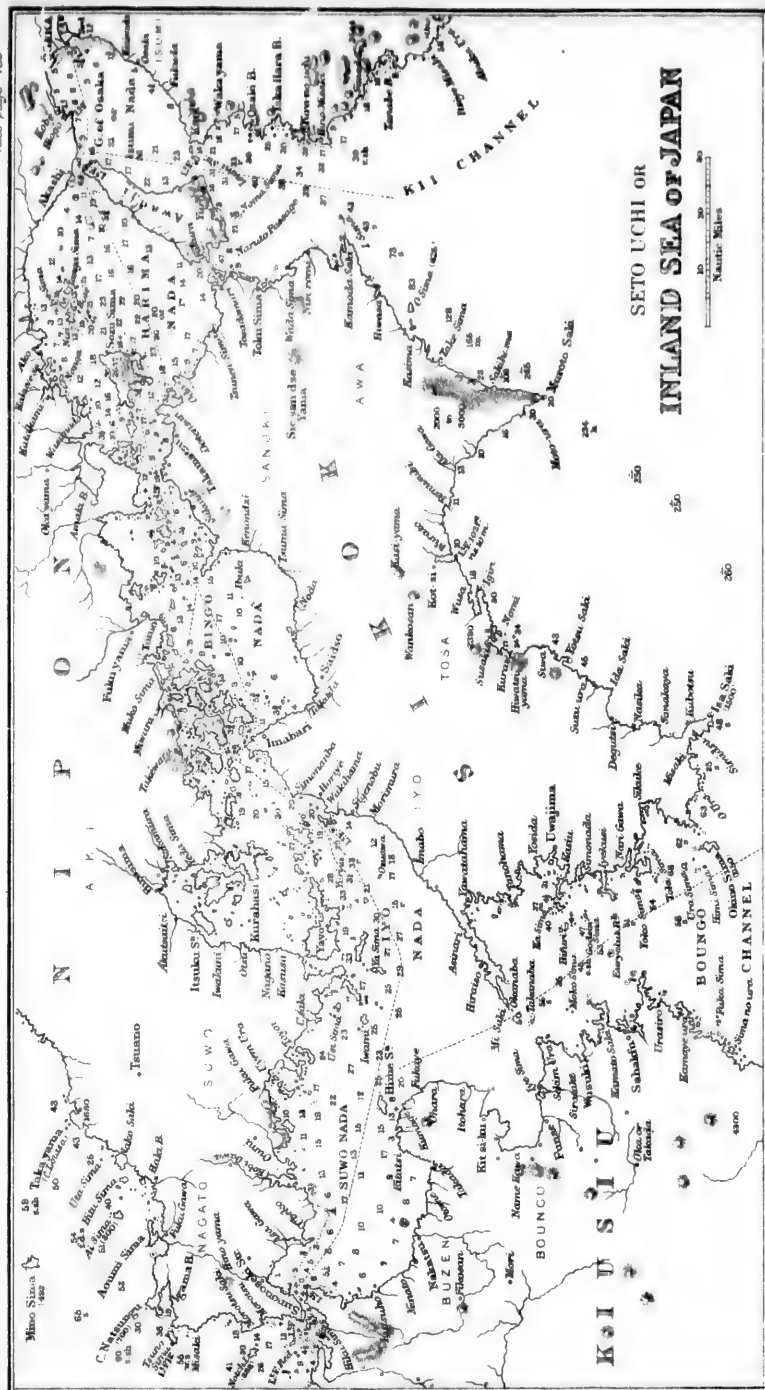
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Kii Channel on the East, and by Boungo Channel, between Kiusiu and Sikok, on the South; and with the Sea of Japan by the Strait of Simonoseki on the West. There is a great maritime trade along its populous shores, as well as the through traffic to Ōsaka, one of the chief seats of commerce of the empire, and the seaport of its ancient capital, Miako.

The Seto Uchi can be navigated with safety at all seasons of the year, and even under favourable circumstances during the night, the more particularly now that it is lighted and a correct chart of it has been published. In winter, when westerly gales are so prevalent, sailing vessels would probably gain time by tiding through this sea, rather than by endeavouring to beat round Satano misaki.

Supplies.—Water, of excellent quality, can be procured almost at any anchorage, and fowls and fish can be obtained at the villages. A very destructive species of mollusk inhabits the Seto Uchi, and might prove very injurious to ships' bottoms.

Tides.—The tides and currents of the Seto Uchi are fairly well known. The tide wave comes from the Pacific by Kii and Boungo Channels; from the latter it branches East and West, meeting the Kii Channel tide at about Awa sima, in long. $133^{\circ} 38'$ E., at the eastern entrance of the Bingo nada.

The **WESTERN ENTRANCE** to the Seto Uchi is at its outer part 35 miles across, being formed by the West coast of Nipon running South for 25 miles from Kado sima, and the North coast of Kiusiu taking an easterly direction for the same distance, from Wilson Island. At the angle where these coasts meet within 3 miles is the large island Hiku sima, South of which is the fairway and entrance to the Strait of Simonoseki.

Kosime no oosima, or *Wilson Island*, 3 miles off the coast, and 2 miles W.S.W. from Koko sima, is remarkable from its prominent position off the entrance to the Inland Sea. It is flat, 6 miles in circumference, and surmounted by a clump of trees, the highest part being elevated 854 ft., and visible in clear weather 30 miles. A large fishing village lies on its eastern shore between two rocky points, off which rocks extend for nearly a mile. *Serpent Rock*, with 6 ft. on it at low water, lies immediately off the village, and nearly 1 mile from the North point of the island. A rock, with less than 6 ft. on it, lies half a mile from the N.E. point, with Round Rock bearing E. by S. $\frac{1}{2}$ S., distant 14 cables. A shoal extends eastward of the S.E. point, with 3 fathoms on its outer end, at a distance of 6 cables.

Koko sima, 600 ft. high, lies 2 miles E.N.E. from Wilson Island, the channel between having a depth of 5 to 12 fathoms. From its S.E. point a long stony spit extends nearly to the land. There is anchorage on both sides of it. *Round Rock*, 30 ft. high, lies $7\frac{1}{2}$ cables to N.W. A rocky patch of 15 ft. lies E. $\frac{1}{2}$ N., $3\frac{1}{2}$ miles from the North point, with the outer high peak of Kiusiu (1,900 ft.) bearing S. by W. $\frac{1}{2}$ W., $3\frac{1}{2}$ miles. The clump on Wilson Island, kept open of the North point of Koko sima, leads northward of it.



From Kanega saki, abreast of Koka sima, the coast trends E.N.E., $8\frac{1}{2}$ miles, to *Iwaya Point*, the western point of the approach to Simonoseki Strait. As this part has not been very closely examined, great caution is necessary in approaching it.

Siro sima.—These two islands, 6 cables apart, and each half a mile long, lie W. by N. $\frac{1}{4}$ N., 16 miles, from the outer point of Wilson Island. The N.E. island, 447 ft. high, with a wooded summit of rounded outline, has two high rocks off its rugged North point, and a shoal spit running 4 cables off its South point. The S.W. island is indented, its eastern sharp peak being 282 ft. high; there is shoal water off its South point, but its West point is steep-to. A rocky shoal extends $1\frac{1}{2}$ mile S. by E. of the eastern point. A rocky patch with less than 2 fathoms on it, half a mile long East and West, lies S. by E. 3 miles from the eastern sharp peak, and W. by N. $\frac{1}{4}$ N. $2\frac{1}{2}$ miles from Iwaya Point.

Iwaya Point, low and rocky, with projecting ledges, is about 5 miles S.S.W. of Siro sima, at the termination of a sandy bay 5 miles wide. A conspicuous wooded hill, 1,100 ft. high, with a round gap in its summit, rises 5 miles S.W. by W. $\frac{1}{4}$ W. of the point.

Eastward of Iwaya Point the shore is generally low and skirted with ledges, but the back ranges are from 2,000 to 4,000 ft. high. The shore of Nipon is higher, but its hill ranges are lower.

Masui sima, or *Notch Island*, lies 6 miles N.E. by N. of North Siro sima, and 3 miles from the shore of Nipon, off Cape Morotzu, the hills over which are 1,000 ft. high. The channel between is free from known danger. The northern part of this island is a triple-topped bluff, 900 ft. high; on the West coast, about the middle, there is a very sharp peak. A small rock lies 1 mile E.S.E. of the South bluff.

Ai-no sima, or *Flat Island*, 6 miles S. by E. from Masui sima, is a flat island, 84 ft. high, covered with trees, and 1 mile in length. Reefs, dry or sunken, extend about 1 mile northward off its North point, their northern extremity being marked by a conical red buoy, bearing a cage, moored in 5 fathoms. A spit runs $5\frac{1}{2}$ cables southward of the South point; foul ground also extends 8 cables E.N.E. of this point, at 7 cables distant marked by a small square rock.

Lighthouse.—*Shirasu*, or *Low Reef*, lying $1\frac{1}{2}$ mile S.W. of Ai-no sima, is nearly 5 cables in extent, North and South, and near its South end is a lighthouse, 48 ft. high, painted in black and white bands, from which is shown a fixed red light, elevated 44 ft., and visible 10 miles.

Rokuren Island, or *Mutsure*, 2 miles S.E. by E. of Ai-no sima, has on its table land a large and conspicuous clump of trees, 340 ft. above the sea, which is visible after rounding Wilson Island, when it will bear about E. $\frac{1}{4}$ N. A spit extends 2 cables from the North point. The *U-ma sima* group of islets and rocks lies to the S.W. of Rokuren, a shoal bank joining them.

LIGHTHOUSE.—On the East extreme of Rokuren is a granite lighthouse, 34 ft. high, showing a fixed bright light, elevated 89 ft., and visible 12 miles,

between N.W. $\frac{1}{2}$ N. (leading half a mile North of the shoal ground North of Ai-no sima) and S. by W. $\frac{1}{2}$ W., through North, East, and South.

HIKU SIMA, lying at the western entrance of Simonoseki Strait, is 3 miles in extent North and South, and has a smooth green hill, 365 ft. high, on its North point. Its western point, *Cape Sizikuts*, is a low rocky promontory, with an island off it, which, as dangers extend a quarter of a mile off it, should not be approached nearer than 4 cables. Its S.W. point, *Entrance Head*, is a wooded bluff, 372 ft. high. The island is separated from Nipon by a narrow shallow channel, named *Kosedo Strait*.

Light.—A *fixed bright* light is occasionally shown about two-thirds up the hill, on the North point of entrance to *Fuku-ura*, a small shallow harbour near the South end of the island.

There is a small anchorage on the S.E. side of Masui sima. There is anchorage also along the Nipon shore, East of Ai-no sima and Rokuren, in 7 and 9 fathoms, but the coast should not be approached within half a mile, as it is fringed with reefs; northward of this the reefs extend a mile off shore. If, however, there be sufficient daylight to get round Rokuren, it is recommended to do so instead of anchoring outside for the night, and bring-to on the bank half a mile South of the U-ma sima group, in 6 or 7 fathoms. There is also anchorage in 8 to 10 fathoms, eastward of Hamo Bank. Directions are given hereafter.

It is high water at the western entrance of Simonoseki Strait, on full and change, at 9^h 0^m; springs rise about 4 ft., neaps 1 $\frac{1}{2}$ foot.

The STRAIT OF SIMONOSEKI, commencing at Entrance Head, the S.W. point of Hiku sima, is 7 miles in length, with a navigable channel varying from 3 to 7 cables in breadth, but the entrances are encumbered with sand-banks. It was surveyed by Capt. St. John, H.M.S. *Sylvia*, 1872-5. The town of Simonoseki stands on the Nipon shore, 4 miles within the entrance.

Hiku Flat, 1 mile W.N.W. of Entrance Head, is a bank of sandstone rock, 8 cables long, and 3 cables broad, with 13 ft. water on it. A red *buoy*, bearing a cage, lies in 9 fathoms, 8 cables N.W. $\frac{1}{2}$ W. from Manaita Rocks beacon.

Kokura Ledge is a flat of sand and rock, with shoal patches on it, fronting the low shore of Kiusiu, South of Hiku sima, where stands the town of *Kokura* on a small stream called *Ogawa*. The flat extends from 1 to 2 miles off shore. *Hamo Bank*, of 3 $\frac{1}{2}$ to 5 fathoms, lies 4 cables N.E. of Hiku Flat, and extends 6 cables N.W. and S.E., forming a channel 3 cables wide between it and the shoal bank extending from Hiku sima.

Manaita Rocks, lying nearly 2 cables South of Entrance Head, uncover towards low water, and are marked by a conical *beacon*, 20 ft. high, painted in black and white rings, and surmounted by a ball. *Narusi Rock*, a quarter of a mile S.W. of Kibune Point, the S.E. point of Hiku sima, and 1 $\frac{1}{2}$ cable off shore, uncovers before half ebb, and is also marked by a white conical *beacon*, 20 ft. high, surmounted by a pear-shaped top.

Yodsihi Rock lies $4\frac{1}{2}$ cables E.N.E. of Kibune Point, and is best avoided by hugging the Hiku sima shore. It only shows at low tide, and is marked by a conical red *beacon*, 30 ft. high. It may be passed on either side, but the western channel is the wider.

SIMONOSEKI, or *Shimonosaki*, is an important town from its position at the entrance of the Inland Sea. It is formed of a single principal street running for nearly 2 miles at the base of some low steep hills along the shore of Nipon. Its most conspicuous buildings are the telegraph and custom houses, the latter recognized by its tall white gables.

Supplies of beef, vegetables, and fruit can be obtained at moderate prices. The coal, which is much used here in the forging of nails, was of the worst possible description, and gave 75 per cent. of ash and earthy matter. Water of excellent quality was brought off in buckets in large boats. The Japan Mail Company's steamers call here weekly.

To anchor off the town, take a position well below the custom-house, in 6 to 10 fathoms, out of the tides, which are very rapid through the narrows, with strong eddies along the shore during the western stream.

Tides.—It is high water at Simonoseki, on full and change, at $8^h 30^m$; springs rise 8 ft., neaps 6 ft. The western or flood stream makes at $2\frac{1}{2}$ hours before high water, the eastern stream $2\frac{1}{2}$ hours after high water, so that the western stream continues 5 hours, and the eastern 7 hours.

Off Mozi saki the velocity at springs is 7 to 8 knots, at neaps 3 to 4 knots; the current is at its full strength for 3 hours of each tide. There are heavy overfalls in the eastern part of the strait at springs.

The **Eastern Entrance** to Simonoseki Strait lies between I saki and Kusi saki, $2\frac{1}{2}$ miles apart; but it is divided into three channels by two extensive sand-banks, named Middle Ground and Tano Bank.

LIGHTHOUSE.—*I saki*, the eastern promontory of the North point of Kiusiu, may be passed at a distance of 2 cables. On its extremity is a granite lighthouse, 30 ft. high, from which is exhibited a *fixed* light, elevated 122 ft., and visible 16 miles; it shows *red* from W. by N., through North and East, to S.E. $\frac{3}{4}$ E., and *bright* thence, over deep water, to S. $\frac{1}{4}$ W.

Kusi saki, the North point of entrance, has a reef extending 1 to $1\frac{1}{2}$ cable off it. To the north-eastward is the village of Toyo, and the ruins of the large military station of *Chofu*. *Kanzu* and *Manziu* are two wooded islands, $6\frac{1}{2}$ cables and $1\frac{1}{2}$ mile respectively, E. by N. of Kusi saki. *Kanzu* is low and flat, with some rocks off its South point. *Manziu* is 198 ft. high.

Midway between Kusi saki and I saki, the *Middle Ground*, a bank of sand, extends $1\frac{1}{2}$ mile East and West; it is from a half to 3 cables in width, with from 1 to 3 fathoms on it. This bank divides the strait into two channels, that to the northward carrying the deepest water. A *red* buoy, with a cage, is moored in 3 fathoms on the western patch, $4\frac{1}{2}$ cables from the West extreme, with Kusi saki bearing N.W. by N. $\frac{1}{4}$ N., distant 1 mile; and I saki light-

house S.E. by S. $\frac{1}{4}$ S., 14 cables. A black buoy, with a cage, is moored in 3 fathoms, southward of the eastern patch, and 3 cables westward of the eastern edge of the shoal, with I saki lighthouse bearing S. $\frac{1}{4}$ W., distant 1 mile, and Kusi saki N.W. $\frac{1}{4}$ W., $1\frac{1}{2}$ mile.

Tano Bank has from $2\frac{1}{2}$ to 4 fathoms on it. Its western extreme lies 5 cables E. $\frac{3}{4}$ N. from Mozi saki, and thence it extends eastward nearly a mile, dividing the channel southward of Middle Ground into two channels, neither of which is to be preferred to the channel North of Middle Ground. Anchorage in 5 fathoms may be found on the North side of the bank, well clear of the tide-race.

Kanabuse, or *Fisherman Rock*, lies northward of Tano Bank, and 11 cables N.E. by E. $\frac{3}{4}$ E. from Mozi saki; it is 120 yards long N. by W. and S. by E., has only 4 ft. on its southern end, 12 ft. on its northern end, and 5 fathoms between at low water. A buoy, painted in black and white rings, carrying a cage, is moored in 9 fathoms, half a cable South of the southern rock, with Mozi saki bearing S.W. by W. $\frac{3}{4}$ W., distant $1\frac{1}{4}$ mile.

The *North Channel*, northward of Middle Ground, is, with the exception of the Kanabuse, clear of danger. The *Middle Channel*, between Middle Ground and Tano Bank, carries 4 fathoms at low water springs. *Hino yama*, a conspicuous triple peak, 933 ft. high, opposite Mozi saki, kept bearing W. $\frac{1}{4}$ N. until the clump of trees on *Take saki*, the South point of the town, comes in line with Mozi saki, leads through. This channel is well marked by buoys. The *South Channel*, southward of Tano Bank, is the narrowest, although the tides here are not so strong. It has a least depth of $5\frac{1}{2}$ fathoms.

Mozi saki is the extreme of a promontory at the North end of Kiusiu, and the strait is narrowed to 3 cables between this point and the eastern end of the town. Immediately over it is a hill, 583 ft. high, with some tall trees on its summit. A telegraph cable is here laid across the strait, its position being marked by buoys and beacons. The tide runs with great velocity.

Whitshed Bay, on the South side of Mozi saki, affords good anchorage in 5 to 7 fathoms, with Mozi saki and Observation Point in line, or a little open, bearing North; and Mozi village bearing East. Here the heavy ships of the allied fleet, under Admiral Kuper, anchored after the reduction of the batteries in September, 1864; but it is stated to be only suitable for vessels of moderate draught. An extensive shoal of 3 to 4 fathoms fills up the whole of the southern and outer part of the bay.

Directions.—Great caution is necessary in passing through Simonoseki Strait. It is recommended that vessels should anchor, if the tide be not favourable on arrival at either entrance, and they should pass through the strait as near the time of slack water as possible.

If bound to Simonoseki from the westward, pass about 1 mile North of Wilson Island, and steer E. by N. $\frac{1}{4}$ N. for the North point of North Siro sima,

North Pacific.

which pass at half a mile; then steer East, taking care not to bring the North point of North Siro sima to the northward of West, till the centre of Ai-no sima bears South, or Rokuren lighthouse opens out S.E. $\frac{3}{4}$ S., or at night until the light is sighted, so as to clear the reefs off the North point of Ai-no sima, marked by a buoy.

The *Southern Channel* is not recommended. It only shortens the distance 4 miles, and requires the large scale chart as a guide. To the S.E. of Shirasu there is a depth of 2 to $2\frac{1}{2}$ fathoms in it.

After passing the buoy North of Ai-no sima, steer to S.E., with the smooth hill on Hiku sima in line with the North extreme of Rokuren, S.E. $\frac{1}{4}$ S.; or, by night, when the light is sighted, bearing S.E. $\frac{3}{4}$ S., steer for it. Round Rokuren at about half a mile distant, and keep the lighthouse bearing between N. $\frac{1}{4}$ E. and N. by E. $\frac{1}{4}$ E., and when Entrance Head is seen in line with the peak, 1,261 ft. high, immediately S.W. from Clump Hill, 1,778 ft., bearing S.E. $\frac{3}{4}$ S., steer for it. These marks kept on will lead 4 cables westward of Cape Sizikuts, and to abreast the Hiku Flat buoy; whence, by keeping the East extreme of Kanasaki sima in line, astern, with Cape Sizikuts, N.W. by N. $\frac{3}{4}$ N., the vessel will pass between Hiku Flat and Hamo Bank, and $1\frac{1}{2}$ cable westward of Manaita Rock. Continue on this leading mark a little past the beacon until the "Rocky Eminence," a peak, 1,193 ft. high, on the eastern shore, is in line with Kibune Point, E. by N. $\frac{3}{4}$ N., when alter course to E. by S., and when Mozi saki is open of Kibune Point, N.E. $\frac{1}{4}$ N., steer N.E. $\frac{1}{4}$ E. towards Yodsibi Rock beacon, which will lead past Narusi Rock to abreast of Kibune Point.

From Kibune Point steer towards Hino yama, bearing N.E. by N. $\frac{1}{4}$ N., up to abreast of the town, and when Kusi saki is seen open of Mozi saki, the vessel's course may be altered to pass in mid-channel off Mozi saki.

After passing Mozi saki, to pass through the *North Channel*, steer to the eastward, with that point in line with the clump of trees on Take saki, W. by S. $\frac{3}{4}$ S., astern, which will lead North of Tano Bank, and 1 cable southward of Fisherman Rock buoy, from abreast of which steer towards the centre of Manziu, N.E. by E. $\frac{1}{4}$ E.; and when I saki lighthouse is seen in line with the western buoy of Middle Ground, S.E. by S. $\frac{1}{4}$ S., alter course to E. $\frac{3}{4}$ N., with Hino yama bearing W. $\frac{3}{4}$ S., which will lead North of Middle Ground in not less than 8 fathoms. When the centre of Manziu bears N. by W. $\frac{1}{4}$ W., steer S. by E. $\frac{1}{4}$ E., which will lead eastward of Middle Ground in about 6 fathoms, close to shoal water on the eastern side.

When I saki lighthouse bears N.W. $\frac{3}{4}$ W., haul to the south-eastward into the Inland Sea; and at night keep the bright light in sight to avoid the shoal ground off Moto yama.

The *Middle Channel* is most generally used, as it is well buoyed. After passing Mozi saki, steer, as before directed, to the eastward, with Mozi saki in line with the clump of trees on Take saki, astern, W. by S. $\frac{3}{4}$ S., and when

abreast of Fisherman Rock buoy, steer towards the eastern Middle Ground buoy, E. $\frac{1}{2}$ N., until I saki lighthouse bears S.E. by S., when alter course to S.E. $\frac{1}{2}$ E. to abreast of the lighthouse; when bring it to bear N.W. $\frac{3}{4}$ W., astern, and proceed into the Inland Sea.

For proceeding through Simonoseki Strait from the eastward the above directions should be reversed.

The ensuing directions for the Seto Uchi are abbreviated from those drawn up by Commanders C. Bullock and F. W. Jarrad, R.N. They can only be used in connection with the chart (Admiralty chart, No. 2875), which is composed from the Japanese Government map before referred to, with subsequent corrections by European officers. The intricate nature of the navigation cannot here be verbally described.

The **SUWO NADA**, the western division of the Seto Uchi, is bounded on the North by the provinces of Suwo and Nagato in Nipon, on the South by the province of Buzen in Kiusiu, and on the East by Hime sima. It is about 40 miles in length East and West, and the depth is not too great for anchorage.

Moto yama, the promontory about 7 miles eastward of Simonoseki Strait, has a long point terminating in a perpendicular bluff, with several clumps of trees on it. A shoal bank extends $5\frac{1}{2}$ miles S.E. $\frac{1}{2}$ S. from the point, its southern limit marked by a red buoy bearing a cage, in $5\frac{1}{2}$ fathoms. *Cape Imagawa*, $10\frac{1}{2}$ miles W.S.W. of Moto yama, terminates in a bluff point.

Hime sima is $3\frac{1}{2}$ miles long East and West, with a conspicuous sugar-loaf peak 885 ft. high. *Nisi ura*, a bay at its N.W. end, affords good anchorage in 5 to 14 fathoms, sand, with easterly winds between E.N.E. and South. *Miname ura*, on its S.W. side, is sheltered from northerly winds between W.N.W. and N.E., with anchorage in $4\frac{1}{2}$ to 8 fathoms. The tides are strong here, and the holding ground bad.

In the entrances of *Kumage* and *Nisinaka Bays*, on the coast S.W. of Hime sima, there is anchorage in 5 to 6 fathoms, mud. *Naga saki*, westward of these bays, has a wooded rock off it, and a clump of trees on its perpendicular extremity.

Iwami sima, in the eastern part of this sea, has a cone-shaped island eastward of it, which may be passed close on the S.W. *Uwa sima*, 3 miles to the S.W., is small, with a cluster of rocks off the S.W. side.

Directions.—To pass through the Suwo Nada, from I saki, steer S.E. $\frac{1}{2}$ E. 10 miles, or until the promontory of Moto yama bears North. An E. by S. $\frac{1}{2}$ S. course may then be kept for 26 miles, which will lead $1\frac{1}{2}$ mile North of Hime sima, and continuing 22 miles farther on the same course will lead $1\frac{1}{2}$ mile South of Ya sima, which may be rounded at a mile. Allowance must be made for the tide.

In passing through the Inland Sea, as it is generally necessary to anchor at night, so it is important that as many convenient anchorages as possible should be indicated along the route. Among those in the Suwo Nada are the follow-

ing:—In 5 to 8 fathoms for 10 miles south-eastward of the strait, or about the southern edge of the Motoyama Shoals. In $5\frac{1}{2}$ fathoms, muddy bottom, at *Mitazidi*, in about lat. 34° N., long. $131^{\circ} 33'$ E., with the small conspicuous island, *Taba sima* (*Saba sima* ?), bearing S.W. $\frac{1}{2}$ W. It has a great trade in salt. On the N.W. side of *Kasato Island*, which is approached from the S.W. passing S.E. of three islets; and also at the port of *Kaminoseki*, opposite the town which stands on the North side of the East point of an island of the same name, a large place of trade.

IYO NADA, the next arm of the Inland Sea, lies between the islands and rocks off Nipon to the N.W. and the clearer western coast of Sikok, and is about 45 miles in extent. To pass through it, from $1\frac{1}{2}$ mile South of *Ya sima*, steer E. by N. $\frac{1}{2}$ N., 14 miles, and pass half a mile South of *Ko Minasi*; then shape a more northerly course, passing on either side of *Yuri*, and through the channel North of *Gogo sima* or *Kosii*.

Ya sima is about 500 or 600 ft. high at its North and South points, and low in the middle. Anchorage may be obtained in 11 fathoms near the middle of the western side. *Ko Minasi sima*, $1\frac{1}{2}$ mile South of *Minasi*, and 13 miles E. by N. from *Ya sima*, is about 200 ft. high, and may be passed at a quarter of a mile on the South. *Minasi* is 550 ft. high. *Yuri* makes like two islands from the N.E. or S.W., joined by a sandy beach; it may be passed on the South or on the North at a third of a mile. The eastern end is 410 ft. high.

Gogo sima, of very irregular outline, and thickly wooded, is 4 miles long, and lies close off Sikok, the channel between being deep and clear. The southern part forms in a wooded peak 945 ft. high. *Yura Bay*, on the East side of the island, affords sheltered anchorage, but an isolated bank of 9 ft. lies nearly in the middle. There is also good anchorage in the North bay and off the town of *Mitsuga Hama*, about E. by S. of the South point. Also in *Hiyoriye Bay*, eastward of the North end, avoiding the rocks and shoals marked on the chart.

LIGHTHOUSE.—*Tsuru sima*, a small island 6 cables long, N.W. and S.E., lying off *Yura Bay*, has a round wooded summit 502 ft. high, and on the N.W. point is a lighthouse, 30 ft. high, showing a *fixed bright* light, elevated 186 ft., and visible 20 miles seaward between S. $\frac{3}{4}$ W., through West and North, and E. by N. $\frac{1}{2}$ N. It is high water here, on full and change, at $10^h 10^m$; springs rise 11 ft., neaps $7\frac{1}{2}$ ft.

MISIMA NADA.—This portion of the Seto Uchi is 30 miles in extent, East and West, about the same North and South, and is studded with numerous groups of islands, islets, and rocks, of which as yet little is known. At its North extreme is the large town of *Hiro sima*, on the shore of Nipon. The southern boundary of the Misima Nada is an extensive chain of islands stretching in an East and West direction. From *Gogo sima*, passing South of *Nokona Island*, and West of *Simonanba Point*, a N.E. course will lead through the Misima Nada up to *Kadjitori Point* and *Cape Iyo* or *Ozumi no hana*, off both which are rocks. North of the latter is an archipelago 30 miles in extent.

The **BINGO NADA** is about 30 miles wide, and about 38 miles long, N.N.E. and S.S.W. It is comparatively clear, having only a chain of six islands stretching across its centre in a N.W. and S.E. direction, and a few others lying near Kurusima Strait. *Tomo* is a town on the North shore, in about lat. $34^{\circ} 22\frac{1}{2}'$ N., long. $133^{\circ} 23\frac{1}{2}'$ E., famous for its *sake* distilleries. There is a pier harbour here for small vessels, and anchorage in 5 fathoms in the roadstead.

From the Misima Nada to the Bingo Nada two routes are indicated on the chart: a *northern route* through the archipelago, by the Aogi seto and Mekari seto, a channel circuitous, narrow, and intricate, amongst high islands, but the tides are not so strong, and a *southerly* one, Kurusima Strait, much to be preferred, as shorter by 6 miles, safer, and more open, passing South of and avoiding the archipelago. A third passage, the Kuruma no seto, also through the islands, is the shortest, but not good.

Kadjitori saki is a sharp promontory, terminating in a bluff 200 ft. high; on its southern side is *Obe Hato ura*, in which there is excellent anchorage in 6 to 8 fathoms. *Ozumi no hana*, or *Cape Iyo*, 3 miles to N.E. by E. $\frac{1}{2}$ E., is the northern termination of a promontory of undulating hills, forming the western boundary of Kurusima Strait. A low grassy island lies off it, and a reef extends beyond this, having at its outer end a flat rock, 3 ft. above high water.

Kurusima no seto, the southern channel to the Bingo Nada, is about $1\frac{1}{2}$ mile wide in its narrowest part, between the S.W. point of O sima and the village of Obama on Sikok, but northward of this line it is much encumbered by islets and rocks. *Nezumi sima*, lying off Hashi hama Inlet, has a wooded summit 356 ft. high; *Ko no se*, or *Perseus Rock*, with 4 ft. on it at low water, lies $1\frac{1}{2}$ cable E. by N. from the N.E. point, and a shoal bank also extends $8\frac{1}{2}$ cables to the N.W., with several patches of rocks on it. *Shiroi iva*, a white rock 25 ft. high, lies near the middle of this bank, and at $7\frac{1}{2}$ cables N.W. $\frac{1}{2}$ W. of it is a rocky patch of $3\frac{1}{2}$ fathoms.

Uma sima, half a mile S.E. of *Nezumi sima*, has two summits, the southern 290 ft. high; foul ground extends a short distance around its shores. *Nagato sima*, $2\frac{1}{2}$ cables eastward of *Uma sima*, is a round wooded islet, steep-to on the West side. *Mushi sima* consist of four wooded islets, lying about $2\frac{1}{2}$ cables N.E. of *Nagato sima*. *O sima*, a large island on the North side of Kurusima no seto, bears evidence of volcanic origin in the remarkable features of its innumerable peaks, deep valleys, and off-lying pinnacle rocks. *Tsu sima*, a wooded island, with two summits, lies half a mile from the West shore of O sima, and is steep-to, except on the S.E. side.

The southern coast of the approach to the strait may be known by two curiously shaped hills, one with a double summit, on one of which is a clump of trees, 1,202 ft. above high water; the other hill has a lower clump, 363 ft. above high water, close to the shore, $2\frac{1}{2}$ miles South of the large town of

Imabari, which is also very conspicuous. *Obama* village lies $2\frac{1}{2}$ miles N.W. of *Imabari*, and $2\frac{1}{2}$ cables N. by E. $\frac{1}{2}$ E. from the rocky point northward of the village is *Shiroi iwa*, a white-topped rock, 13 ft. high. *Amaze Rock*, dry at low water, lies $3\frac{1}{2}$ cables N. by W. $\frac{1}{2}$ W. from *Shiroi iwa*.

The following directions, with the aid of the large scale chart, will guide a vessel safely through. After passing *Kadjitori saki*, steer to pass a quarter of a mile North of the flat rock off *Ozumi no hana*, when the conspicuous tree, in the first gap South of *Kiro yama*, on the South side of *O sima*, will be seen in line with the North extreme of *Mushi sima*, bearing S.E. by E. $\frac{1}{2}$ E. This mark should be kept on until the West extreme of the N.E. point of *Hashi hama* is open East of *Nezumi sima* bearing S.W. $\frac{1}{2}$ S., which clears *Perseus Rock*. A course may then be steered to pass West of *Uma sima*, borrowing rather nearer to that island than the mainland, to avoid *Amaze Rock*. *Uma sima* may be rounded at 2 cables, or, continuing the leading mark a little farther on, a course may be steered to pass between *Uma* and *Nagato sima*, keeping the latter island close on board. The other channels should not be attempted.

Tides.—From *Ozumi no hana* the flood stream sets towards *Nezumi sima* and *Tsu sima*, sweeping over *Perseus Rock* towards the North point of *Uma sima*, and then takes the direction of the channels. The ebb runs with great velocity from *Imabari* to the North, and sweeps directly through the channel between *Uma* and *Nagato sima*, causing on the North side heavy whirls. The velocity at springs is from 4 to 6 knots.

It is high water, on full and change, at *Hangata*, a village midway between *Hashi hama* and *Ozumi no hana*, at $10^h 36^m$; springs range $11\frac{1}{2}$ ft., neaps 5 ft.

Anchorage.—There is good anchorage off *Hangata*, North of *Hirosé Rocks*, in 7 fathoms, $2\frac{1}{2}$ cables from the shore. There is no really safe anchorage off *Obama* or *Imabari*. Anchorage, though in a strong tideway, may be had with off-shore winds, in from 11 to 13 fathoms, sand, good holding ground, with *Imabari* pier bearing S.S.W., distant $2\frac{1}{2}$ cables.

The *Northern Route* to the *Bingo Nada* passes through the *Aogi seto* and *Mekari seto*, and the tides here are much weaker than in *Kurusima Strait*. The entrance to *Aogi seto* may be readily distinguished by the conical hill and white boulders of *Ko-oge sima* and the dark wooded *Oge sima*, care being taken not to mistake the S.W. point of *Okamura* for *Ko-oge*, as it also has some white rocks at the base. From mid-channel between these islands, steer to pass midway between *Noka no hana* and *Niwatori jima*, after which steer midway between *Osaki sima* and *Yoko sima* until abreast the South point of the latter, when close the *Osaki* shore, to avoid the foul ground West of *Yoko sima*.

After passing *Kodono sima*, give its North shore a berth of $3\frac{1}{2}$ cables, and pass West of the buoy marking the rock awash 2 or 3 cables from its North end, after passing which steer to pass midway between *Matsu sima* and *Kuno*

sima on the North, and O-mi sima on the South; and when East of this channel, bring the round wooded summit of Osaki sima (*not* the clump) in line with the North extreme of O-mi sima, S.W. by W. $\frac{1}{2}$ W. These marks in line, astern, lead between Admiral and Captain Banks, to mid-channel between that island and the main land. The North shore should be kept about half a mile off until abreast Kosaki sima, when that island may be rounded, borrowing rather over to Matsu hama, the village S.E. of the large town of *Miwara*, to avoid the sandbank between Sukune sima and the beacon East of it.

Between Iwashi sima and Hosō sima, keep in mid-channel and also between Mukai sima and In-no sima, until Sasa jima, the small islet off Mukai sima, bears N. by E., when the fall of Hachi gaune, the bluff East entrance of *Miwara*, should be brought in line with the N.E. point of Huso sima, bearing N.W. by W. $\frac{1}{2}$ W.; this mark will lead out into the Bingo Naga, clear of all dangers.

Tides.—The tidal streams appear to take the line of the channels, running with a velocity of $2\frac{1}{2}$ to 4 knots, the flood to the eastward. It is high water at *Miwara*, on full and change, at 10^h 37^m; springs range 11 ft., neaps 5 ft.

Anchorage.—Vessels will find temporary anchorage in 9 to 13 fathoms, good holding ground, with the South point of *Okamura* bearing East, and the South end of the village of *Mitarai* N.W. There is good anchorage in 10 to 11 fathoms off the North end of *Yoko* sima, and excellent anchorage off *Miwara* in 5 to 10 fathoms. At the southern entrance of the *Mekari seto* a mud-bank extends between *Hyaku Kuan* and *Yuge* sima, affording excellent anchorage, except off the channel between *Yuge* sima and *In-no* sima.

Kuruma no seto.—Follow the directions for *Aogi seto* until clearing the channel between *Kuno* and *O-mi* sima, when round the shore of the latter at about $7\frac{1}{2}$ cables, and steer S.E. to pass a quarter of a mile East of *Hiotan jima*, and the same distance West of the S.W. point of *Seto-da jima*, bearing in mind that the ebb sweeps strongly towards the beacon on the West side of the channel. Keep about a quarter of a mile off the *Seto-da jima* shore until the islet off the East point of *Hakata* sima, at the East entrance to the channel, opens of the N.E. point, bearing S.E. $\frac{1}{2}$ E., when steer to pass the latter point at a quarter of a mile, and then for mid-channel between the islet off the East point and *Mu* sima, taking care to keep the S.W. point of *Seto-da jima* open of the N.E. point of *Hakata* sima, N.W. $\frac{3}{4}$ W., to avoid the foul ground between the East and N.E. points of that island.

Tides.—In the *Kuruma no seto* the flood stream sets to the S.E., and the ebb to N.W., with a velocity of $2\frac{1}{2}$ to 3 knots.

Fronting the *Kurusima no seto*, in the *Bingo Nada*, are a range of islets enclosing the *Hi-uchi Nada*. *Kadji*, the N.W. island, is a round double-topped island, 264 ft. high, with a red cliff on the hill-side North of the summit. *Miojin*, to the eastward, is 325 ft. high, and makes in three lumps, the highest having a lump of trees. *Shi-shaka* consists of two islands, the higher a grass-

covered hill 501 ft. high. *Hiki sima*, 5 miles south-westward of Shi-shaka, is a group of four islets, the eastern one surmounted by a conspicuous chimney-shaped clump, 242 ft. above high water.

Farther eastward is another range of islands. *Toyo*, the N.W. island, has a double peak on its East end, 300 and 250 ft. high. *Takaikami*, *Oki*, and *Yeno*, form a conspicuous group. *Takaikami* has a single peak 800 ft. high; *Oki*, three peaks 530 ft. high; and *Yeno*, one peak 200 ft. high. *Mata sima* is about 100 ft. high, and has a few conspicuous trees on it. *Momo* appears barren, and has three small knobs on it, the highest of which is about 150 ft. *Ibuki* is about 100 ft. high, and bluff at the East end.

A line of islands also trends south-eastward across the eastern side of the Bingo Nada from Tomo towards a projecting peninsula, *Akenose misaki*, on the East side, $11\frac{1}{2}$ miles distant. *Hasiri* has two peaks, the eastern 400 ft. high. *Udsi*, to the S.S.E., has two peaks, 370 ft. high. *Mutsu sima* is 600 ft. high, and cultivated; two rocks, covering at a quarter flood, lie nearly half a mile westward of it. *Nezumi sima*, 4 miles E. $\frac{1}{2}$ S. from Mutsu, is about $1\frac{1}{2}$ cable in extent, 63 ft. high, and of a brown colour, surrounded by rocks.

Directions.—To pass through the Bingo Nada from Kurusima Strait, give the islets off the South end of O sima a berth of about a mile, and then haul up W.N.W., passing northward of Kadji and between Takaikami and Oki sima, whence the same course continued will lead between Mutsu sima and Akeno misaki, the entrance of the channel from the Bingo Nada to the Harima Nada.

Akeno misaki is a thickly wooded cape, rising gradually to *Shiwoonde yama*, a bare mountain, 1,130 ft. high, with a large clump of trees on its summit. Eastward of this the shores of Nipon and Sikok approach, the channel between them being encumbered with numerous islands and dangers, the positions and proportions of which will be best understood by referring to the large scale chart. On the southern shore are several towns and large villages, the chief being *Tadotsu*, *Marugame*, and *Sakaide*.

Light.—Near the central part of this channel is *Yo sima*, with *Nabae sima*, about 1 cable in extent, off its S.E. point. On the summit of Nabae sima is a granite lighthouse, 30 ft. high, showing a *fixed bright* light, elevated 85 ft., and visible 12 miles between N. by E. $\frac{1}{4}$ E. and W. $\frac{1}{4}$ N. Lat. $34^{\circ} 23' 5''$ N., long. $133^{\circ} 49' 10''$ E.

St. Vincent Channel passes between the islands Sanagi, Hiro, and Siyako on the North, and Nezumi, Takami, Usi, and the North edge of Conqueror Bank on the South. In the centre of this channel, off Hiro sima, is *Habushi iwa* or *Ten-feet Rock*, 20 ft. high, and whitened. The channel southward of Conqueror Bank is now very seldom used.

Directions.—In sailing from the Bingo Nada into the Harima Nada, keep as nearly as possible to the mid-channel track marked on the Admiralty chart. The clump on Siyako Island in line with the South extreme of Habushi iwa, E. by N. $\frac{1}{4}$ N., leads between Sanagi and Nezumi; and to clear the bank ex-

tending 3 miles eastward from the former, keep the North points of *Usi sima* and *Habushi iwa* in line. Pass on either side of the latter, and then bring its South extreme its own width open of the North point of *Takami*, astern, and steer E. by N. $\frac{1}{2}$ N., which will lead between *Siyako* and *Usi sima*, and northward of *Conqueror Bank*. Thence steer to pass midway between *Nabae sima* lighthouse and *Sanmen sima*, where the channel is only $4\frac{1}{2}$ cables wide. A course thence E. by N. $\frac{1}{2}$ N. will lead to a position midway between the conspicuous cone-shaped island *Odutsi*, 549 ft. high, and the small island *Koduchi*, southward of it.

From midway between *Odutsi* and *Koduchi* steer E. by N., taking care to keep the South point of *Te sima* a little open southward of *Kasiwa*, to pass southward of *Galatea Shoal* and the bank extending $3\frac{1}{2}$ miles westward of *Oki sima*. When off the North point of *Oki sima*, alter course to E. by S. till the South extreme of *Kasiwa* touches the North point of *Oki sima*, and then steer S.E. by E. into the *Harima Nada*.

Anchorage.—On the South side of the western entrance to *St. Vincent Channel* is *Awa sima*, having bays on its North, South, and West sides, in either of which anchorage may be obtained. *Ino ura*, on the South side of *Hino sima*, affords convenient anchorage out of the strength of the tides, but care is necessary, as the head of the bay shoals very suddenly. Anchorage may also be obtained in either of the two bays between *Ohara no hana* and *No-o saki*, to the S.W. of *Koduchi*. Inside the shoal off the city of *Takamatsu* good anchorage may be had in 6 and 7 fathoms, sand and mud, about a mile from the shore. The tides, however, are very strong, and great caution is necessary in approaching this bay.

Tides.—It is high water at *Siyako*, on full and change, at 0^h 16^m; springs rise $9\frac{1}{2}$ ft., neaps 4 ft., the flood setting to the westward.

HARIMA NADA, the next division of the *Inland Sea*, lies off the N.E. end of *Sikok*, and is about 25 miles in diameter. It lies between *Sozu sima* on the West and *Awadji sima* on the East, having about 20 fathoms water over its deepest part; the southern portion is clear of dangers, but the northern portion is encumbered with numerous islands, rocks, and shoals.

Sozu sima, a large island in the eastern part of the *Harima Nada*, is 12 miles long, 7 miles broad, and 2,686 ft. high, with a temple on the summit. On its South side the high promontory of *Djizo hana* or *Yosino*, terminating in a bluff 994 ft. high, stretches to the southward, forming a conspicuous landmark throughout the *Harima Nada*, and the narrow sea to the westward. On its southern and eastern shores are several bays in which anchorage may be found. Between *Okado Point*, the S.E. point, and *Higiri saki*, $2\frac{1}{2}$ miles to W. by N. $\frac{1}{2}$ N., is *Sakate Bay*, into which a heavy sea sets with S.E. winds, and the water is somewhat deep. *Uchi no umi*, a magnificent and spacious harbour entirely landlocked, the entrance to which is between *Higiri saki* and

North Pacific.

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Djiso hana, affords excellent anchorage for all classes of vessels in from 7 to 8 fathoms, mud bottom, in any part of the harbour. On its shores are several large villages, the principal being *Kusakabe*. Two dangerous reefs lie near the East shore of the entrance.

Off the East side of Sozu sima are several isolated rocks. The outermost are *Naka no she*, a dangerous sunken 3-ft. rocky patch, $1\frac{1}{2}$ cable in extent, lying nearly $2\frac{1}{2}$ miles E. by N. $\frac{1}{2}$ N. from Djiono sima, and *Midzu no ko*, 13 ft. high, $8\frac{1}{2}$ cables S.E. $\frac{1}{2}$ S. from *Naka no she*.

Hanam ura, on the Sikok shore, S.W. of Yosino bluff, is a fine harbour, but has a $3\frac{1}{2}$ -fathoms shoal nearly in the middle of its entrance. A large town stands at its head. On the promontory which forms its West side, the high rugged *Peak of Gotensan*, a sacred mountain, 1,260 ft. high, is a very conspicuous object. Large vessels will find good anchorage in 8 fathoms, mud, midway between the entrance points of *Naga hama ura*, the eastern arm of the bay. Vessels drawing less than 16 ft. may anchor closer in, or may anchor in *Sido Bay*, the western arm, in 21 ft. water. It is high water at $11^h 15^m$; springs rise $5\frac{1}{2}$ ft., neaps 2 ft.

Oda Bay, eastward of *Hanam ura*, is 2 miles wide at its entrance, and about the same in depth, the village of *Oda* lying at its head. *Oda Point*, the eastern point, terminates in a steep cliff, and off it is a large high rock resembling a man's hand. The point should not be approached within a distance of 2 cables. Anchorage may be had in 7 to 9 fathoms at the head of the bay, on the bank extending to N.N.W.

Tsuda Bay, south-eastward of *Oda Bay*, is $1\frac{1}{2}$ mile in width, and on its sandy beach are the villages of *Tsurua* and *Tsuda*. It affords excellent sheltered anchorage, except from winds between N.N.E. and E.S.E., which send in a heavy sea. The best anchorage is in $5\frac{1}{2}$ to 6 fathoms, 5 to 6 cables off the sandy beach. It is high water, on full and change, at $11^h 50^m$; springs rise $6\frac{1}{2}$ ft., neaps 2 ft.

Taka sima, covered with brushwood, lies $3\frac{1}{2}$ cables from the northern point of *Tsuda Bay*, and at $2\frac{1}{2}$ cables N.E. of it is *Oki no isso*, a reef of rocks, 2 cables in length North and South, and uncovering at low water. *Saruko sima*, a small islet joined to the coast by a shingle spit, lies W.N.W. of *Taka sima*, and at $1\frac{1}{2}$ cable N.E. of it is a reef on which is a remarkable pinnacle rock.

Ounobe yama, the eastern point of *Tsuda Bay*, has several rocks off it, and between it and *Ko Isso Point*, 2 miles to the E.S.E., is *Masima Bay*, with good anchorage in 6 fathoms. The shore is formed of projecting cliffs, with small sandy beaches between them. *Ko Isso Point* is the extremity of a sharp wooded peak named *Dino yama*. Sand-banks extend northward of it, *Marukama Islets* lying near the extremity. *Ino sima*, 5 cables to W.S.W., rises to a sharp peak. At *Ko Isso mura*, a small port three-quarters of a mile south-eastward of *Ko Isso Point*, the chain of hills surrounding *Tsuda Bay* ceases. From hence to *Matsu ura* the coast is steep-to, forming an extensive sandy beach.

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Matsu ura, a bay 1 mile wide, lying westward of Ioji hama no hana, affords good anchorage, open between N.E. and N.W., in 5½ to 6½ fathoms. A reef extends half a cable N.E. of *Ioji hama no hana Point*, and has a conspicuous rock on it.

F'tago sima, two high islets surrounded by rocks, lie half a mile N.N.E. from Ioji hama no hana, there being a depth of 2½ fathoms in the passage between. *Stots sima*, about 1 mile N.N.W. of Ioji hama no hana, is flanked on its North and West sides by large, high rocks.

Hikieta Point, 2½ miles S.E. of Matsu ura, is formed by an isolated chain of hills; its eastern side is bordered by several rocks, and to the N.W. of the extreme point is a small rocky island joined to the coast by a spit of sand. The village of Hikieta is situated on the sandy beach on the South side of the point. *Matsu sima*, 1½ mile eastward of Hikieta Point, is high on its North side, and bordered by rocks on its S.E. side, a rocky bank, 3 cables long, also lying 2 cables W. ½ S. from the islet. *Triple Islet*, 3 cables E.N.E. of Matsu sima, appears like three islets lying close together. Anchorage may be obtained in 7½ fathoms, mud, between Hikieta Point and the above-mentioned rocky bank; with the two islets in line, distant 3½ cables, and Hikieta Point bearing W. ½ N.

To the S.E. of Ioji hama no hana is *Ioji hama*, a massive, isolated, and thickly wooded hill, with a high sharp summit immediately over the coast, which is bordered by cliffs, with off-lying rocks extending nearly 2 cables from it. Between this hill and Hikieta Point is a cultivated valley at the head of a small bay, in which there are salt-pans.

At about 7 miles westward of Hikieta Point is the entrance to Naruto Passage; the coast between has not been surveyed.

To the north-eastward of Sozu sima lies a large group of islands, of which *Nisi sima* is the most important. *Nisi sima* is about 2 miles long, and on its North and South sides are bays where excellent anchorage may be had. The island is uninhabited, and to the southward of it lies the *Matsu sima* group of islets and shoals. Eastward of *Nisi sima* are three large islands, named *Bosé*, *Yé*, and *Tanga*, with numerous islets and rocks. Westward of it is *Inghé sima*, with rocks extending to the S.S.W.

Itsu Bay, on the Nipon shore, northward of this group, in long. 134° 30' E., affords good anchorage in 3 to 4 fathoms, open to the southward. *Morotsu Bay*, westward of *Itsu Bay*, is nearly 1½ mile wide between its entrance points, and has a depth of 4½ to 3½ fathoms all over it. Four small islets lie off it. *Oo ura*, West of *Morotsu Bay*, is a long narrow inlet, with a depth of 4 to 3½ fathoms, where small vessels will find excellent anchorage. An islet lies off the middle of the entrance. *Sakoshi Bay*, West of *Oo ura*, has a depth of 3½ fathoms, and vessels may anchor as convenient. It is high water at *Oo ura*, on full and change, at 10^h 10^m; springs rise 5½ ft., neaps 4½ ft.

Port Wusimado, on the mainland of Nipon, about 6 miles North of the

western point of Sozu sima, is not altogether easy of access, as the channel is little more than 2 cables wide, shoaling suddenly on both sides. It is sheltered from the south-eastward by *Mae sima*. The entrance is between the western edges of the shoals extending westward from Mae sima and Kuro sima and the shore of the mainland. Anchorage may be taken up as convenient in 9 fathoms at about 3 cables from the town wharves.

Port Okoyama, the entrance to which is $4\frac{1}{2}$ miles W.S.W. from Port Wusimado, is in a narrow strait connecting the Harima Nada with a shallow sheet of water, known as Amaki Bay. At $1\frac{1}{2}$ mile from the entrance, on the North shore, is the mouth of the *Saidaidji gawa*, a river of some magnitude. *Hi gawa*, the mouth of which is 3 miles farther on, is a much narrower stream, but has a greater depth of water. *Okoyama*, containing about 200,000 inhabitants, is an important commercial centre. In entering, steer with Kogushi Fort, on the South side $1\frac{1}{2}$ mile within the entrance, bearing N.W., until Komo saki, the South point, bears South, when haul up N.W. by N. $\frac{3}{4}$ N., steering to pass midway between the two forts; and when the temple on the South end of Take sima opens clear of the South shore, steer to the westward, keeping about 1 cable from the South shore. Anchorage may be taken up in 6 to 9 fathoms. It is high water, on full and change, at 10^h 15^m; springs rise 6 ft., neaps $4\frac{1}{2}$ ft. The tidal streams are very strong.

AWADJI, the largest island of the Inland Sea, is 30 miles in length North and South, and 14 miles across at its southern or broadest part, which is between the projecting promontories of Nipon and Sikok, at the eastern entrance of this sea from Kii Channel, which it divides into two passages, the Strait of Iseumi on the East, and Naruto Passage on the West. Awadji is mountainous, from 1,000 to 2,000 ft. high, but the hills taper away towards its North cape, which is low and sandy, with batteries on it.

LIGHTHOUSE.—On *Ye saki*, about half a mile W. $\frac{1}{2}$ S. from the North point of Awadji, is a granite lighthouse, 27 ft. high, showing a *fixed bright* light, elevated 158 ft., and visible 18 miles between S.W. by W. $\frac{1}{2}$ W. and East, through North.

Akashi Strait, between the North point of Awadji and the coast of Nipon, is about $2\frac{1}{2}$ miles wide, and commanded by forts on both shores. It is nearly free of danger, and its shores are steep-to. The tides here are very rapid.

On the North shore of the strait is the town of *Akashi*, the residence of a Daimio. From the West end of the town a bank of mud extends to the W.S.W., with a series of shoals on it, and terminated by *Shika no se*, a narrow rocky bank of 6 to 12 ft., extending $2\frac{1}{2}$ miles W. by S. $\frac{1}{2}$ S. and E. by N. $\frac{1}{2}$ N.; its eastern extreme of 12 ft. lying 8 miles W. by S. $\frac{1}{2}$ S. from the stone lantern at Akashi. Near the middle of its southern edge a red buoy, bearing a cage, is moored in 17 fathoms. Lying nearly parallel to *Shika no se*, at $2\frac{1}{2}$ miles southward of it, is *Murozu no se*, a bank of sand with $5\frac{1}{2}$ to 7 fathoms on it.

Takuye no se, a shoal of 2 ft., lies 7 cables off Awadji, about 6 miles to the S.W. of its North point.

Directions.—In passing through the Harima Nada, the track marked on the chart should be closely adhered to. After rounding the high bluff of Djizohama, gradually alter the course to E.N.E. for Akashi Strait. Ye saki lighthouse bearing E. by N. $\frac{1}{2}$ N., in line with the summit of End Hill, leads between Murozu no se and Shika no se. After rounding the lighthouse, the course may be shaped into the Isumi Nada.

Anchorage is found off *Yei Bay*, 12 miles S.W. of Ye saki, in 9 fathoms, one-third of a mile from the shore, and all along towards that point in 7 to 12 fathoms. There is also good anchorage in 9 fathoms, sand, on the North side of the strait in *Yamata ura*, lying between Kara saki and Akashi. *Yamati iso*, a 2-ft. rock, lies $3\frac{1}{2}$ cables N.W. by W. $\frac{1}{2}$ W. from Maiko fort. Off *Iwaya*, on the N.E. side of Awadji, there is excellent anchorage in 8 fathoms.

Tides.—It is high water in Akashi Strait, on full and change, at 6^h 27^m; springs rise $3\frac{1}{2}$ ft. The tidal streams are variable, causing heavy tide rips.

Ichino-hana yama, or *End Hill*, is a wooded hill, 820 ft. high, 5 miles eastward of Akashi. *Taka iso*, a 9-ft. rock, lies nearly a cable off shore, $5\frac{1}{2}$ cables westward of Shiwoya village. *Hira iso* has 6 ft. on it at low water, 4 cables off shore, $3\frac{1}{2}$ miles E. $\frac{1}{2}$ N. from the North point of Awadji. A red buoy, bearing a cage, is moored in 5 fathoms southward of it. Ye saki lighthouse kept bearing West, till End Hill bears N.E., leads South of it.

The **ISUMI NADA**, or Gulf of Oosaka, at the N.E. extreme of the Inland Sea, and 35 miles in extent N.E. and S.W., is bounded to the South by a promontory of Nipon, and to the West by the large mountainous island of Awadji. Its shores are in general high and thickly wooded; in some places, however, they are low and sandy. It is singular in having neither an island nor a danger in it. On the East shore of Awadji the water is deep, with no convenient anchorages except in small bays close in. The coast of Nipon, on the contrary, affords good anchorage along its whole extent, reefs only extending 1 or 2 cables off it.

OOSAKA, a city of great commercial importance, was opened as a treaty port to foreign commerce January 1st, 1868. In 1882 it contained 587,998 inhabitants, and, unlike most Japanese cities, its houses are of two stories. It stands on the N.E. shore of the sea, and on the left bank of the main stream of the *Yodo gawa*. This river, which takes its rise in the great inland lake, Biwa, after flowing on a south-westerly course for 30 miles, enters the Gulf of Oosaka by several channels. At the lower or north-western corner of the city the river divides into two branches—the *Agi kawa*, as the Yodo is here called, continuing directly towards the sea; the other branch, the *Kishu gawa*, takes a southerly course, and discharges itself $2\frac{1}{2}$ miles lower down the gulf. These two branches are navigable by junks of moderate size, but the heavier classes are compelled to discharge their cargoes in the roadstead.

Oosaka is intersected by several canals, which are mostly very shallow, and only navigable by the flat boats of the country. The castle of the Tycoon is on the N.E. of the city, overlooking the river.

The Foreign Concession, named *Ebisu jima* or *Kawa guchi*, occupies the angle formed by the Aji and Kishu branches; its position is indicated by lofty trees. The right of building is confined to this site, but the right of residence extends over the contiguous suburb westward. It is $2\frac{3}{4}$ miles above Temposan, the fort at the river's mouth, and 2 miles below the castle.

At Oosaka are some iron and ship-building works, where both sailing vessels and steamers are built and repaired. There is also a dry dock, capable of taking vessels of 220 ft. long, and drawing 9 ft. water.

The River Aji, which enters the Isumi Nada between two jetties, is shallow, but may be navigated by ships' boats as far as the castle; it has a bar, which at unusually low tides would be nearly dry; at exceptionally high tides, 7 to 9 ft. might be carried over. The channel is marked by large piles, the two outer having triangular vanes to distinguish them; the shallowest part is just outside these outer beacons, and the best passage over is at one-third the distance from the North beacon, so as to avoid a shoal extending S.W. from the other. When inside, the deep water is close along the groynes on the South side, which always show. There is generally 3 ft. more water in the lower part of the river than on the bar.

Directions from within the Bar.—Keep the South bank of the river, which will lead up in a nearly direct course to the Tycoon's Castle (above the first bridge the river is seen to turn off sharp to the South: this is the Kishu branch), keep close past the Concession, but in the same direction, for above this the river has two distinct channels, separated by narrow islands and shallow sand-banks, which can seldom be crossed.

Bats may be obtained just above the fort, or at Ichikashiuden on the left bank, $2\frac{1}{2}$ miles higher up.

Light.—The large fort of Temposan, which stands on the South side of the entrance, commands the entrance of the river; it is a high turfed earthwork, scarped with masonry, and is a conspicuous landmark, the shores being very low. On the parapet of its western salient is a white lighthouse, 35 ft. high, from which a fixed bright light is exhibited, elevated 53 ft., and visible 12 miles.

Oosaka Roads are open to the West and South. The depths are extremely regular, diminishing gradually over a soft mud bottom; the holding ground is so good that it is considered a vessel could ride out any gale in safety. The shores are everywhere of clean sand (as are the river bars), but it constitutes a fringe only, mud being found at a cable from the low-water line. The best anchorage is West of the Temposan lighthouse, $1\frac{1}{2}$ to $1\frac{3}{4}$ mile distant, in 4 to 5 fathoms.

Kishu gawa River.—At 2 miles S.S.E. of Oosaka bar is the bar of the Kishu, at the North point of entrance of which river stands a small star fort

at low-water mark, a mile from the shore. This bar has not been closely examined, but it is probably a little deeper than that of the Agi, as a larger class of junks ascend this branch to Oosaka. The channel is marked by beacons.

Sakai.—At $4\frac{1}{2}$ miles S. by E. from Temposan is the mouth of Sakai River, which enters the sea between two short moles extending from two green batteries; it has no bar, and has 3 to 6 ft. at the entrance, opening into an artificial harbour, with a depth of 5 and 6 ft. in it.

Light.—On the end of the South pier is a white lighthouse, 37 ft. high, showing a *fixed green* light, elevated 53 ft., and visible 10 miles.

HIOGO and Kobe, a *treaty port*, 12 miles West of Oosaka, is a better and more convenient anchorage than the roadstead of Oosaka, having slight protection from the South, and being thoroughly sheltered from the prevailing westerly winds. Hiogo Bay has an even depth of $4\frac{1}{2}$ fathoms, with good holding ground, mud bottom. The foreign settlement is situated at the head of the northern bay of Kobé. This bay is somewhat smaller than that of Hiogo, but its shores are steep, with about the same depth of water, and, if less sheltered in S.W. winds, it is less exposed to easterly winds. Several streams flow into the bays. In 1883 the population amounted to 54,421, with 460 Europeans and Americans, chiefly missionaries, and 754 Chinese. During autumn and winter smallpox is very prevalent here.

British subjects are free to go wherever they please within 21 miles of Hiogo in any direction, that of Miako (Kioto) excepted. The crews of vessels resorting to Hiogo must not cross the River Ena gawa, which flows into the bay between Hiogo and Oosaka.

An iron pier, in connection with the railway* which runs to Oosaka and Kioto, allows of vessels going alongside to load and unload. A Japanese Company has lately erected another iron pier, 450 ft. long, near the western camber, extending into 23 ft. at low water, and furnished with steam cranes. In connection with this pier is a series of brick warehouses. The exports are tea, raw silk, copper, wax, camphar, porcelain, &c., principally to America; the principal imports are cotton and woollen goods, metals, and kerosine oil. In 1883, 177 foreign vessels, with a total tonnage of 207,713, entered the port, of which 124, with a tonnage of 159,298, were British. In the same year the value of foreign imports at Hiogo and Oosaka amounted to £1,735,352, and the exports to £1,348,690.

* The railway between Kobé and Oosaka (Agi kawa), $21\frac{1}{2}$ miles long, was opened in May, 1874. From Oosaka it is continued in a N.E. direction, past Kioto the ancient capital, to Otsu at the South end of Biwa Lake, a distance of nearly 37 miles. Thence a line of steamers crosses the lake to Nagahama, 40 miles distant, whence another line of railway extends to Tsunaga, on the N.W. coast, 26 miles distant. Another line is being constructed north-eastward of Nagahama. It is proposed to extend this railway, so that all the chief ports of Nipon shall be in communication, including Tsuruga and Niigata on the West coast, and Nagoya, at the head of Owari Bay, and Yokohama on the South coast.

On the West shore of the bay is a patent slip, 300 ft. long, suitable for vessels of 800 tons, and another is being constructed to take vessels of 1,000 or 1,500 tons at all times of tide. There are facilities here for building and repairing both sailing and steam vessels.

Supplies of all descriptions may be procured at Kobé in abundance at tolerably cheap rates. Government coal is stored here in charge of a contractor, who also supplies fresh meat, vegetables, and water. The fresh water obtained at Kobé is good; that of Hiogo is indifferent. Large timber, chiefly cedar (Sungi), is also procurable for shipbuilding purposes.

Time Signal.—A gun is fired at noon, Kobé mean time, Sundays and general holidays excepted, and a ball is dropped at the same time on a flagstaff on the bund.

LIGHTS.—On *Wada no misaki*, the S.W. point of Hiogo Bay, is a white lighthouse, 46 ft. high, showing a *fixed red* light, elevated 52 ft., and visible 12 miles seaward between N.W. by N. $\frac{1}{2}$ N. and W.S.W.

On the eastern pier head at Kobé a *fixed green* light, elevated 42 ft., and visible 6 miles, is shown from a staff, and a smaller *red* light from a staff on the western pier head.

Directions.—If entering Hiogo at night from the West, keep Awadji Island light bearing West until the light on Wada no misaki bears North, when steer N.N.E. for the anchorage; and when the shipping lights are seen bearing N.N.W. or N.W., steer for them, and anchor as convenient. From the southward, after passing Isumi Strait, steer N.E. by N. $\frac{1}{2}$ N. for Wada no misaki light, and when Awadji light opens out, haul to the eastward until Wada no misaki light bears North, when proceed as before mentioned for the anchorage. It must be borne in mind that the ebb tide sets to the westward towards Akashi Strait, and the flood to the eastward towards Oosaka, 2 knots an hour at springs, increasing in strength as Akashi Strait is approached.

The coast as far as *Tree Point*, 9 miles eastward of Kobé, is safe of approach, the shore being steep into 4 fathoms, except the bay directly East of Kobé, where a sand-bank of less than 2 fathoms extends half a mile off shore.

Tides.—It is high water at Hiogo, on full and change, at 7^h 15^m; springs rise 6 ft., neaps 4 ft., neap range 2 $\frac{1}{2}$ ft. The range of any day seldom exceeds 5 ft. at springs, or 18 inches at neaps. The flood runs to the eastward.

At Oosaka Concession the establishment is 8^h 17^m; springs rise 30 inches, neaps 6 inches. The flood stream does not reach the Concession.

ISUMI STRAIT, between the S.E. point of Awadji and Nipon, is divided into three channels by the islands Tomangai and Diyi. *Tomangai*, the western island, is wooded, with the exception of its West hill, cleared apparently for military purposes; there is a fort close to the North of the S.W. point across a small ravine, and facing the West. *Diyi*, is wooded, but lower. The West or main channel is 2 miles wide, but contracted by a sand-bank, which extends half a mile off the large fort of *Yura*, and by reefs stretching 3 cables off the

S.W. part of Tomangai. The centre passage is only 1 cable wide, and full of rocks. The eastern channel, called *Dzinozetti*, is a quarter of a mile wide, and said to be clear and safe, between the reefs which extend $1\frac{1}{2}$ cable off both shore and island.

LIGHTHOUSE.—On the western extreme of Tomangai is a granite lighthouse, 30 ft. high, showing a *fixed bright* light, elevated 208 ft., and visible 19 miles between S. $\frac{1}{2}$ E. and N.E. by E., through South and West.

Yura is a town in a curiously sheltered harbour on the S.E. side of Awadji, on the West side of Isumi Strait. A low island, $1\frac{1}{2}$ mile in length, of sand and shingle covered with scrub, with a bluff hill, 126 ft. high, on its North point, and a large granite fort on its South, lies like a breakwater fronting a bay, and forms the harbour, which has narrow entrances North and South. A little North of the fort, where the island is stony, it covers at high water, but a boat can scarcely pass over it. A vessel drawing 16 ft. could enter by the North channel at high water springs, and lie secure in smooth water for repair.

Anchorage may also be obtained in 2 to 5 fathoms outside the island on the sand-bank off it, with the outer extreme of the bluff N.W., or of the fort S.S.W., but it is very steep on the edge, and the holding ground is probably not good. Springs rise $6\frac{1}{2}$ ft.

Kata is a town on the eastern side of Isumi Strait, on the South side of a bay North of Takura saki, where there is anchorage in 5 to 8 fathoms. There is a fine landing-pier here 200 yards in length. Off Takura saki, and in Kata Bay as far as Diyi Island, reefs, covering at high water, extend about 3 cables off the shore.

It is high water at Yura and Kata, on full and change, at $6^h 5^m$; springs rise $6\frac{1}{2}$ ft., neaps $4\frac{1}{2}$ ft.

The South Coast of Awadji sima is clear of danger within a mile, and $1\frac{1}{2}$ mile off it lies *Noma sima*, formed of some very flat-topped hills from 100 to 200 ft. high, bordered with low cliffs. It has reefs a cable off its South point, and there is a bay and village on its West side.

KII CHANNEL, between Sikok and Nipon, is 80 miles across at its entrance from the Pacific, but the width decreases to 15 miles at 30 or 40 miles within, which width it preserves for 20 miles farther, or up to Awadji. The fairway from Kii Channel into the Seto Uchi is by Isumi Strait, but there is a more direct route, by taking which (if not bound to Oosaka or Hiogo) a saving of 35 miles is effected, viz., Naruto Passage, West of Awadji, but great care is necessary in using it.

NARUTO PASSAGE.—The Naruto (literally, gate of the sea which makes a great roaring) was examined by Commander Charles Bullock, in H.M.S. *Dove*, in 1861. It had previously been considered to be a *whirlpool*, and it is not without cause that this dangerous character has been attributed to it, for *junks* have foundered in its turbulent waves, or been dashed to pieces on its rocks by

North Pacific.

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the impetuosity of the current. This channel, lying between *To saki*, the projecting S.W. promontory of Awadji, and the N.E. extreme of *Oge sima*, called *Mago saki*, is only $7\frac{1}{2}$ cables wide from point to point; and is further narrowed to $2\frac{1}{2}$ cables by an extensive reef of rocks off *To saki*, and some reefs and islets off *Mago saki*. *Mago saki* and *To saki* are low bluffs; *Tobi sima* and *Hadaka sima* rocky islets covered with trees. *Nakase*, lying off *To saki*, is a low rock, which never covers, and off which and *Hadaka sima* stretch extensive reefs bounding the passage, marked during the strength of the tide by seething breakers, which break in several fathoms. N. by W. and S. by E. are the courses recommended when steering through with the tide, keeping midway between the breakers, or between *Nakase* and *Hadaka sima*.

Through this narrow passage the tide runs, or rather falls, with a velocity of 10 to 11 knots, slackening to 7 or 8 knots within 1 or $1\frac{1}{2}$ hour before or after the change of stream, which occurs every six hours, there being no slack water. The junks choose the early and latter parts of the tide, when fair, to pass, but never attempt it when the wind is so strong as to require reduced canvas, for then the sea is so great that vessels are unmanageable; however, there would be no difficulty to steam-vessels taking the passage in fair weather, at any time with a favourable tide, or within an hour of the change of stream before the contrary tide has made strong, as the passage is distinctly marked; but in bad weather it breaks right across, and the passage is scarcely discernible. The roar of the breakers can be heard several miles on a calm night.*

Tides.—It is high water at *Fuk ura*, on the eastern side of the passage, on full and change, at 6^h 17^m; springs rise 7 ft., neaps (probably) $4\frac{1}{2}$ ft. The north-western stream makes at $2\frac{1}{2}$ hours before high water at *Fuk ura*, changing every six hours nearly. North of the *Naruto Passage* the tides are anomalous.

Anchorage.—If wishing to await slack water or change of stream, excellent anchorage may be found on the Awadji shore, southward of *Maru yama*, the N.E. point of entrance of the passage, with *Ben-ten sima*, the islet close off it, bearing North, distant $2\frac{1}{2}$ cables, in 6 to 8 fathoms, sand. *Fuk ura*, eastward of *To saki*, is a fine bay, with excellent anchorage in 7 fathoms, mud, just within the entrance. Large vessels can also anchor in 11 to 13 fathoms off the entrance to *Hi ura* or *Minotoye Bay*, 4 miles westward of the passage; small vessels can go farther in.

On the West side of *Naruto Passage* are *Oge* and *Simada Islands*, with a

* Capt. H. C. St. John, H.M.S. *Sylvia*, who had several times used this channel, once observed a British man-of-war pass through it, and afterwards enquired of her captain why he had done so—"Because it was recommended on the chart; but you will never catch me there again. As I neared it I could see nothing but rocks, breakers, and foam; wished myself out of it, and put the helm hard down; but although the ship was going 12 knots through the water, she would not answer the helm a bit. In another moment I was through, and being whirled about in the eddies in a most horrible manner. In fact, the ship was out of all command."

narrow passage, only used by junks, between them and the Sikok shore. Between the islands is the *Uchi umi*, a large expanse of deep water, only accessible to boats.

Shiwo saki, the S.W. point of Awadji, slopes from a wooded hill 516 ft. high, and terminates in a conical grass mound 167 ft. high. From it shoal water, having 5 fathoms on the outer edge, stretches half a mile West, and a quarter of a mile South. *O-iso*, a projecting sandy point on the opposite side, slopes down from a hill 290 ft. high, ending in a bare conical mound. Rocks, awash, extend 3 cables East. South of this point the coast of Sikok is flat and sandy, fronting a large plain, on the southern edge of which stands the town of *Toku sima*.

I sima lies in Kii Channel, at its narrowest part, at 25 miles S. by E. $\frac{1}{2}$ E. from Naruto Passage. It is small, and its southern peak is visible 30 miles. It may be approached to within a mile, except on the West. The channel to the West, between it and *Kamoda saki*, the East point of Sikok, is 3 miles broad, but extending right across it are several detached groups of rocks, some of them above water, and amongst them (according to the fishermen who acted as pilots) are sunken rocks, over which not more than 24 ft. can be carried in any of the channels, excepting the westernmost, which they stated to be clear of danger and navigable. These channels should not be attempted.

In 1873, a rock, 10 ft. high, was reported by Capt. Hummel, S.S. *Alexander*, at 24 miles S.W. $\frac{3}{4}$ S. of I sima.

Wadasima Harbour.—On the West coast of Kii Channel, 14 miles N.W. of I sima, in lat. $34^{\circ} 0' N.$, is a bay affording excellent anchorage, especially for smaller classes of vessels, in 5 fathoms, sand, completely landlocked; and sufficient shelter for vessels of heavy draught from all dangerous winds in 7 fathoms. Its only known danger is *Johnston Rock*, which uncovers 2 ft. at low water, and lies N. by E. $\frac{1}{2}$ E., $1\frac{1}{2}$ mile, from *Wadasima*, the low East point of entrance.

TAKURA SAKI, the eastern point of entrance of Isumi Strait, is a wooded headland, the extremity of a mountainous promontory, skirted with reefs extending 2 or 3 cables West and South of it. The coast South of it is low and wooded for 5 miles, as far as *Zoga saki*, a rocky point with four small islands off it which are steep-to.

The eastern coast of Kii Channel trends irregularly to the southward. It was surveyed by Commander Charles Bullock, R.N., in the *Dove*.

Hachken gawa is a small river running through a plain 5 miles S.E. of *Kata. Waka yama*, a small isolated wooded hill, is on its left bank, $1\frac{1}{2}$ mile from the entrance; on its summit stands the residence of the Prince of Ksiou, conspicuous from the sea. There is only 3 ft. water on the bar. There are forts on both sides of the river.

South of *Zoga saki* is a bay 4 miles deep, and 3 miles across its entrance, in which anchorage may be found in 4 to 10 fathoms.

Osaki Bay is $1\frac{1}{2}$ mile deep and open to the W.N.W. The village of *Osaki* stands on the shore of a narrow inlet on its North side, where small vessels can find good shelter in 5 to 2 fathoms, which they can also obtain in *Smotz ura*, the innermost bay on the South side. The only danger is a rocky 1-fathom patch 1 cable S.E. of the North entrance head. Water and small supplies can be readily obtained here.

Okino sima, W. by S. $\frac{1}{2}$ S. 2 miles from the entrance of *Osaki*, has a round hill 271 ft. high. *Djino sima*, 1 mile East of it, is 400 ft. high, has high cliffs towards the sea, and is wooded; it may not be passed inside. A rock, awash, lies about 2 cables South of it.

Miya saki, 220 ft. high, and 2 miles South of *Okino sima*, is an abrupt wooded peninsula at the extremity of a range of small hills. On its North side the *Arita*, a small stream, disembogues, and is navigable by small junks for a short distance up. *Miya saki* may be passed at 3 cables.

Takahara Bay is 5 miles deep and 6 miles across between *Miya saki* and *Sirasai saki*, its North and South points of entrance. At its head is the bay of *Hiruwatali*, with anchorage in 7 to 8 fathoms, well sheltered from all winds except W. by S. A pier at the South end of the sandy beach at its head, and off a small town, protects small craft in a shallow inner harbour.

Kura sima and *Taka sima* lie off the southern shore of *Takahara Bay*. Both these islands may be passed at 2 cables, except the South point of *Taka sima*, off which, at nearly that distance, there is a rock awash. The *Karamo* group of small islands, with reefs about their North sides, lie N.N.E. of *Taka sima* and West of *Hiruwatali Bay*, with a cluster of rocks E.N.E. of them half-way to the shore.

Unless desiring anchorage or working to windward against tide, *Takahara Bay* should not be entered within a line joining its points, as there are two dangerous rocks lying in the centre and northern parts of the bay. *Golden Rock*, so named from the large amount of property lost there, is a very small patch, nearly awash at low water, and so steep that the lead gives but little warning. It lies about $2\frac{1}{2}$ miles S. by E. $\frac{2}{3}$ E. of *Miya saki*. The *Sung-ami*, three-quarters of a mile North of the West point of *Karamo*, is a sunken rock with 6 ft. over it, and equally steep-to. It lies $1\frac{1}{2}$ mile N. by E. of *Taka sima*, and S.E. $\frac{1}{2}$ E., $2\frac{1}{2}$ miles, from the point S.E. of *Miya saki*.

Sirasai saki, or *White Rock Point*, derives its name from the large masses of quartz in its cliffs, and which, with the white pinnacle rock 200 ft. high, 4 cables E.S.E. of it, show very distinctly from the South. The point is not high, and a large round rock lies 1 cable N.W. of it. Turtle were seen here. *Fisher-man Reef*, a small narrow rock 4 ft. above high water and steep-to on the outside, lies 4 cables West of *Sirasai saki*. *Oobiki ura* is a bay between *Sirasai saki* and *Yura no uchi*, where a vessel might anchor for the night with the wind off shore, in 6 fathoms.

Yura no uchi is a harbour 4 to 7 cables in breadth, and 2 miles deep, and

being sheltered by the sharp peaked island *Ali sima* and the extensive reefs off the South point of entrance, always above water, is only open between W. by S. and S.W. by W. Winds from these directions cause some swell inside in a gale, but it is nevertheless a secure anchorage, safe during heavy weather or a typhoon. The smooth round hill, *Kasane yama*, on its North side, 860 ft. high and surmounted by a clump of trees, is conspicuous, and well marks its position. To enter, pass North or South of *Ali sima*. It is high water, on full and change, at 6^h; springs rise 5½ ft.

HINO MISAKI, being at the turn of the coast, is the most prominent cape in Kii Channel. Its terminal hill, *Hino yama*, is smooth sloped, 675 ft. high, and the islet off it may be passed at 2 cables. It is steep-to, but the tide sweeping out of the bay South of it causes an appearance of broken water, especially with a North wind. From thence the coast runs south-eastward for 19 miles to Tanabe.

At 2½ miles E.N.E. of *Hino yama*, on the East of the range extending from it, is a high flat-topped saddle of nearly 1,000 ft. elevation, and very conspicuous from the S.E. Eastward of this is a long sandy beach, along which anchorage may be obtained in 4 to 9 fathoms at about half a mile off shore.

The only danger in approaching the anchorage near the mouth of the small river *Hidaka kawa*, is a large flat reef, named *Nosima*, the inner part of which is 15 ft. above high water. It extends two-thirds of a mile off the coast, a mile South of the river's mouth.

Ilibe saki.—The round smooth hill, *Kirime yama*, rises over this prominent point. The coast to the S.E. of the range has several outlying reefs, the largest of which extends 4 cables off *Arari Point* in detached parts, and its extremity is S.W. by W. ¼ W., 3½ miles, from *Ilibe saki*. Eastward of *Arari Point* is a bay affording good anchorage in 5 to 8 fathoms.

North of *Arari Point* is a round hill, on the summit of which are three spike-shaped monuments; and 3 and 4 miles inland, North and N.E. of this, are two large high clumps which are very conspicuous from the offing.

TANABE BAY is formed in a bight of the coast, 22 miles S.W. of *Hino misaki*, its outer parts exposed only to West and N.W. When approaching from the south-eastward, *Itsiye misaki*, the most projecting point of the coast, will first be made, and being very similar to *Cape Tanabé*, the bay between them, in thick weather, may be mistaken for that of *Tanabé*. *Itsiye misaki* is a sloping point with a low terminating cliff, but the hills over it are much higher than those of *Cape Tanabé*, and rise to a sharp peak, the outer of a continuous high range. The summit of *Cape Tanabé*, which has a single conspicuous tree on it, is only 539 ft. high, and falls abruptly inland.

Sato saki, North of the cape, is very dangerous, a reef with two islets on it extending North half a mile from the point, and *Isaki Reef*, of flat rocks above water, lying that distance West of it. There are sunken reefs and shoal water

between the latter reef and the point, and off both reefs the shoal water extends 2 or 3 cables beyond the outer visible dangers.

In 1885 a sunken 6-ft. rock, named *Shakushi* or *Ladle*, was reported to lie $8\frac{1}{2}$ cables W. $\frac{3}{4}$ S. from the outer islet northward of Sato saki, with Cape Tanabé bearing S. by E. $\frac{3}{4}$ E. Foul ground extends about $1\frac{1}{2}$ cable S.S.W. of this rock, and a sunken 9-ft. rock lies about 150 yards N.E. by E. of it.

In the north-western part of entrance of Tanabé Bay are *Saito* and *North Bay Reefs*, 4 cables apart, with a deep-water channel between them. These reefs are low and quite flat. At 2 cables S.E. and North of Saito, the southern of them, are sunken rocks, and off North Bay Reef is a small rock like a boulder. In bad weather, with the wind in, all the known dangers would break.

The best anchorage is in the south-eastern arm of the bay, South of Anchorage Island. This island may be recognised by the dark trees dotted over it, and a tree islet West of it from which a long uncovered reef extends. The end of this reef may be passed at a cable; then steer to pass the same distance off the N.E. point of Anchorage Island, between it and the sunken rocks of Passage Reef in 6 to 10 fathoms, irregular bottom. Having passed along the East side of the island, stand in S.W. $\frac{1}{4}$ S., anchoring in 10 to 8 fathoms, in a secure and thoroughly sheltered position.

The north-eastern part of Tanabé Bay has many shoals. In the centre of the bay is the *Binzli*, an extensive reef with several rocks on it, dry and awash at low water. On the North shore a small river discharges itself, running close under the white loop-holed wall surrounding a residence of the Daimio, the Imperial Prince of Ksiou. The village of *Tanabé* stands on the shore of the sandy bay to the westward of the river, and to the North is a mountain range, the highest part of which rises to the height of 2,650 ft., the ridge curving round to the range which terminates in *Itsuye misaki*.

Tanabé has proved at times a convenient anchorage, the usual position for anchoring being South of the Daimio's residence, but better shelter in westerly winds would be found N.E. of *Binzli Reef*. To anchor, stand in for the green earthwork East of the white wall of the Daimio's residence, bearing E.N.E., till *Ebisima* shuts in with the islet off *Maru-yama Point*; then keep East, and anchor in 6 to 4 fathoms. The low rock of *Binzli* always shows.

The coast, from *Itsuye misaki* to *Siwo misaki*, a distance of 20 miles, is rocky, and indented by many small bays, the hills rising abruptly to a considerable height. The principal places in which small junks seek shelter are *Susami anchorage* and *Hiki gawa*.

SIWO MISAKI, the extreme South point of Nipon, is the S.W. extremity of a promontory of table land which forms the western shore of *Oō sima Harbour*. The shores are rocky, and skirted with many small islets and rocks, *Bottle Rock* lying $2\frac{1}{2}$ cables to the South, with foul ground $1\frac{1}{2}$ cable southward of it. There is a great race off *Siwo misaki*, immediately North of which the tides are felt, though the Japan Stream washes the South shore of this and of

Oô sima. After a south-easterly gale the sea comes in round this point in immense rollers, such as are rarely seen on any coast.

LIGHTHOUSE.—On the summit of Siwo misaki is a white lighthouse, 75 feet high, showing a *fixed bright* light, elevated 163 ft., and visible 20 miles seaward between E. $\frac{1}{2}$ S. and N.W.

Fuku ura, a bight North of Siwo misaki, offers protection to vessels from easterly winds, the anchorage being in 7 to 10 fathoms, 4 cables North of a conical yellow cliff.

Directions.—In passing southward through Kii Channel, it is recommended to steer always for Iino misaki. The course from Isumi Strait is South, 25 miles, and from Naruto Passage S.E. by S., 30 miles, which latter course, continued for 25 miles farther, passes Itsiye misaki at about 3 miles, from which a S.E. by E. $\frac{3}{4}$ E. course for 21 miles leads abreast of Siwo misaki.

South-East Coast of Nipon.—From Siwo misaki the coast trends to the eastward for 71 miles as far as Cape Sima, and is bold and mountainous. It is much indented by bays and inlets, affording anchorage, but there are numerous off-lying islets and rocks. Only the chief features will be briefly described here; the China Pilot and the charts afford fuller details.

OO SIMA HARBOUR, a safe and convenient anchorage, is formed between Oô sima and the East side of Siwo misaki promontory, which is a curious clump of land, 300 ft. high, connected to the mainland by a low isthmus. Its vicinity was surveyed by Commander J. Ward, R.N., H.M.S. *Actæon*, in 1861. The harbour has two anchorages: one in the bay on the S.W. side of Oô sima, completely sheltered, but the water rather deep; the other in 4 to 9 fathoms, muddy bottom and good holding ground, between the villages Kusimoto and Hasingui on the mainland, in the northern part of the harbour.

Hasingui or *Hasikiwi Anchorage*, of 4 to 6 fathoms, is well sheltered, except to the N.E., where it is open from a small arc; it has also some protection from the remarkable chain of rocks, from 20 to 75 ft. high, extending in a southerly direction half a mile from the shore eastward of the village, but being detached with deep water between, they do not form a perfect breakwater. *Pisayama Rock*, the innermost, is in lat. $33^{\circ} 29' 8''$ N., long. $135^{\circ} 48' 55''$ E. The best position is with *Itsino sima*, the outer rock of the above chain, bearing E.N.E., distant $1\frac{1}{2}$ cable, and *Mioga sima*, South, or on with *Isumo saki*, the West entrance point. The best anchorage for all weathers is off Kusimoto village in 9 fathoms, 4 cables from the beach.

This very eligible harbour is largely resorted to by windbound junks, and it offers every facility for repairs and replenishing supplies. There are three villages, two on the mainland and one on the island. Water is easily obtained from the latter village, it being led down in bamboo pipes to the rocks, which have deep water alongside them. The large village of *Kusimoto*, on the isthmus, is well supplied with all the essentials usually required by the coasting trade.

The cargoes of the windbound junks consisted of rice, sugar, tobacco, char-

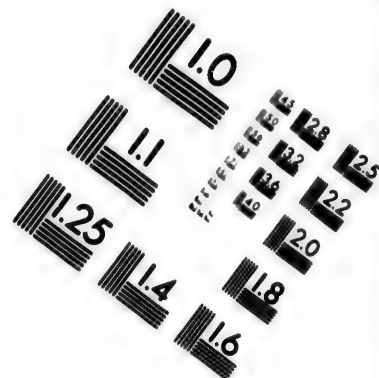
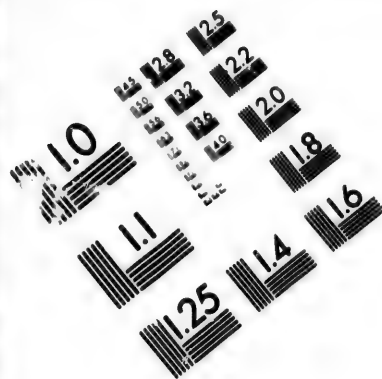
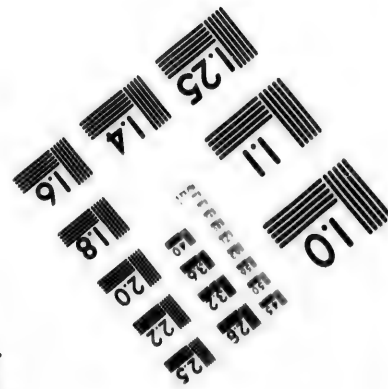
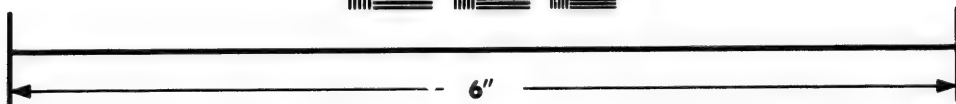
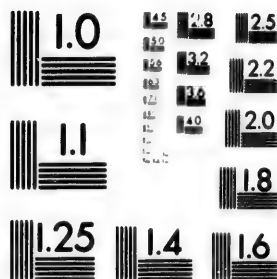


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coal, salt, sake (spirits), and dried fish. Charcoal of an excellent quality for steaming purposes was obtained from them. The villagers supplied fish and poultry; some deer were brought off, also a few bullocks, and a small quantity of vegetables.

LIGHTHOUSE.—*Oō sima* is about $3\frac{1}{2}$ miles long East and West, and rises to a height of 535 ft. On its East point is a white lighthouse, 27 ft. high, showing a *bright* light, revolving every half minute, elevated 130 ft., and visible 18 miles seaward between W. by N. $\frac{1}{2}$ N. and S.W. $\frac{1}{2}$ S.

Directions.—Approaching *Oō sima* Harbour from the westward, a heavy tide-race is often met with off *Siwo misaki*. To clear the dangers extending from the South side of *Siwo misaki* promontory, the right extreme of *Oō sima*, the most southern point seen, must not be brought eastward of E.N.E. until the West point of *Mioga sima*, an island off the West point of *Oō sima*, comes well open of *Isumo saki*, the western entrance point, N.W. by N. $\frac{1}{2}$ N., when it may be steered for, taking care not to bring it northward of that bearing until within half a mile of it, or until the East extreme of *Isumo saki* bears S.W. by S. $\frac{1}{2}$ S., when steer N.W. $\frac{1}{2}$ N., passing mid-channel between the land and *Mioga sima*, which has a small ledge running off its South side; after passing *Mioga*, steer for the anchorage.

If compelled to work in, the *Oō sima* shore is the clearest, but take care to avoid a *dangerous rock* lying $1\frac{1}{2}$ cable W.S.W. of the West point of *Tsuya sima*, an island, 120 ft. high, off the S.W. point of *Oō sima*. The S.W. bay of *Oō sima* is clear of danger.

Approaching the northern entrance of the harbour from the north-eastward, *Oō sima* flat summit bearing S.W. by W. $\frac{1}{2}$ W. leads 7 cables N.W. of *Kami seh Rock* (which has 16 ft. over it, and lies $1\frac{1}{2}$ mile N.E. $\frac{1}{2}$ E. from the lighthouse), and parallel with the mainland, off which are numerous scattered rocks only showing at low water, some more than half a mile off. Continue this course until the lighthouse bears S. $\frac{1}{2}$ W., when *Omi saki*, the North point of *Oō sima*, may be steered for W. by S., which will lead $2\frac{1}{2}$ cables South of a 5-fathoms patch situated S. $\frac{1}{2}$ W. the same distance from *Kuro Sima Rocks*, which are two small rocks with foul ground off their West side. The small rock off *Omi saki* may be passed quite close-to, after which steer westward so as to give the South extreme of the rocks off *Hasingui* a berth of half a cable, and thence to the anchorage.

At night, with the light on *Oō sima* bearing westward of S.W., a vessel will pass well clear of *Arundell Point*. It is recommended to steer so as to pass eastward of *Kami seh Rock*, and thence between it and *Double Rocks* off *Oō sima* East point.

It is high water in *Oō sima* Harbour, on full and change, at 6^h 50^m; springs rise 5 ft., neaps 4 ft.

Kōza gawa is a small but opulent town, situated on the East side of the entrance of a river, $2\frac{1}{2}$ miles N.N.E. of the North point of *Oō sima*. The river

has a shifting bar, but a channel, generally defined by breakers, is always available for coasting junks. At high water, 10 ft. may be looked for on the bar, probably more, but strangers should send a boat ahead to sound. Kosa gawa is the seat of an important whale fishery, and at the North end of the town is an extensive timber yard, in which are spars of considerable dimensions. Small supplies of poultry, fish, rice, &c., can be obtained.

URA-KAMI HARBOUR is an inlet running $1\frac{1}{2}$ mile in a W.S.W. direction into the land, at $6\frac{1}{4}$ miles N.E. by N. from the East point of Oô sima, and, although small, affords excellent shelter in 4 to 5 fathoms, over stiff mud. For steamers it offers an admirable haven, but being only a quarter of a mile wide, sailing vessels might experience a difficulty in getting in or out, particularly in entering, as, from the direction of the valley at the head of the harbour, the wind, which may be fair outside, is frequently found inside to be blowing straight out.

In entering, avoid a spit of rocks projecting about half a mile E.N.E. from the South point of entrance. One of them, named *Hive*, is 36 ft. high, and some are covered, but show sufficiently to be easily avoided.

Arundell Point, the North entrance point of Ura-kami, is rocky, with low cliffs. A wedge-shaped rock, 20 ft. high, lies 1 cable N.E. of it, and a rock, awash at high water, lies S.E. by S. $\frac{1}{2}$ S., $2\frac{1}{2}$ cables from the point. *Taise ura*, two bays westward of *Tomio saki*, the North end of *Arundell Point*, are studded with dangers.

Kats ura is a small and sheltered harbour, protected on the southern side by a small islet, and to the eastward by a point, on the East side of which are high dark cliffs, 160 to 278 ft. high; southward of this point are high pinnacle rocks, and two small islets. The harbour has a depth of 3 to 6 fathoms, sand and mud, the only danger being a small cluster of rocks, awash at high water, 150 yards from the eastern shore. The islet on the southern side forms two channels, but only the eastern, 125 yards wide, is navigable. There is a village here, and some mineral springs. Fish, poultry, rice, and potatoes are plentiful. Large junks load with inferior coal, brought from *Singo*, a town on the *River Otonashi*, 7 miles to the N.N.E.

To enter *Kats ura*, pass between *Black Rock*, lying $6\frac{1}{2}$ cables N. $\frac{1}{2}$ E. from *Tomio saki*, and *Tera sima*, and thence steer for *Bluff Point*, the South point of the islets southward of *Kats ura*, and round it at the distance of half a cable, to avoid some sunken rocks lying to the southward. Anchor N.N.E. of the islet on the southern shore. To the N.W. a fine cascade is visible, falling 275 ft. Large vessels will find shelter from N.W. winds in the bay northward of *Kats ura*, in 10 fathoms.

Eda yama, a sharp peak 1,166 ft. high, 1 mile from the coast, and $2\frac{1}{2}$ miles North of *Otonashi River*, is a useful mark. The coast here is a steep continuous shingle beach for $12\frac{1}{2}$ miles, with some villages on it. At the northern ex-

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trernity of this beach is a small bay, lying between two hilly points, with the village of *Odomari mura* at its head. *Marmurika Rock*, 70 ft. high, lies off the eastern point, and must be passed on its southern side. Small vessels would find shelter here from northerly winds, in about 8 fathoms, in the centre of the bay. *Atashika ura*, N.E. of *Odomari mura*, is open to winds between S.E. by E. and S.W. by S., and has a depth of 5 to 11 fathoms, sand. Fowls, rice, and fish can be procured from the villages. *Negesima ura*, N.E. of *Atashika ura*, has very deep water. The coast hereabout is high and cliffy.

Kada Bay, N.E. of *Negesima*, extends 3 miles to N.N.W., with an arm on either side, the western of which affords sheltered anchorage in 5 to 10 fathoms, nearly at its head. The bay is surrounded by high wooded ranges, and there are several villages on its shores. In entering the bay, pass southward of *Outer Rock*, 30 ft. high, lying nearly 7 cables S.W. by S. $\frac{1}{2}$ S. from *Ishimo saki*, the N.E. entrance point, which is rocky and cliffy. At 3 miles N. by E. $\frac{1}{2}$ E. from this point is *Kuki saki*, a cliffy promontory, the southern point of *Owasi Bay*.

OWASI BAY is 4 miles wide at its entrance between *Kuki saki* and *Domakura saki*, and $4\frac{1}{2}$ miles deep, branching into four inlets, only the northern and southern of which are suitable as anchorages, the others being smaller, and only frequented by junks. *Owasi no minato*, the southern and largest inlet, is open to the eastward. *Yaguchi ura*, the northern one, is 3 miles long, with deep water up to its head, where it shoals gradually off the village, affording excellent sheltered anchorage in 8 fathoms. Fowls, fish, and vegetables may be obtained at the villages.

Togashiru sima, $2\frac{1}{2}$ miles N.N.W. of *Kuki saki*, rises to a height of 527 ft., and is covered with trees, showing in bold relief against the high land behind it. Some other islets and rocks lie to the northward and westward. Vessels entering should pass northward of these. It is high water in the bay, on full and change, at 7^h; springs rise $5\frac{1}{2}$ ft., neaps 2 ft.

Nearly 2 miles N.E. by N. $\frac{1}{2}$ N. from *Domakura saki* is *Sasado saki*, at 1 mile westward of which is *Sima kachi ura*, affording anchorage for small vessels in westerly winds. The land to the westward is high. *Otai yama*, in lat. $34^{\circ} 11' N.$, long. $136^{\circ} 5\frac{1}{2}' E.$, a mountain 5,620 ft. high, is a conspicuous object when approached from the eastward, and is apparently the highest land seen from that direction.

NAG URA, $4\frac{1}{2}$ miles N.N.E. of *Sasado saki*, affords good anchorage for small vessels at all times, but large vessels would not be protected from southerly winds. The approaches from the offing appear to be studded with dangers, but by giving the numerous small islets a wide berth there is no difficulty in entering. *O sima*, the largest of these outlying islands, has a wooded summit 339 ft. high, a conspicuous mark from seaward. *Sabaru sima*, a black rock 14 feet high, lies $9\frac{1}{2}$ cables to S.E. $\frac{1}{2}$ S., and is the outermost.

The bay is 1 mile wide at the entrance, but farther in it narrows and trends

half a mile to the N.E., terminating in two small arms, in the southern of which a small vessel will find sheltered anchorage in 7 fathoms, mud. A large vessel can anchor in $6\frac{1}{2}$ fathoms, sand, $2\frac{1}{2}$ cables from the eastern side of the entrance to the bay. Fish, poultry, rice, and vegetables can be obtained from the villages.

Koa ura, $5\frac{1}{2}$ miles eastward of Nag ura, and *Hosa ura*, 2 miles beyond, are clear of danger, but too narrow to be recommended as anchorages.

Naiya ura, 2 miles East of Koa ura, is $1\frac{1}{2}$ mile wide at the entrance, and $2\frac{1}{2}$ miles deep, with two narrow arms, extending N.N.E. and N.N.W. There are several small islets, but the only danger is *Pearce Rock*, awash at low water, lying off the western point of Hosa ura, 3 cables from the shore. Anchorage may be obtained in either arm, the eastern having a depth of $3\frac{1}{2}$ to 5 fathoms, open to S.S.W.; the western arm, sheltered from all winds, has depths of 9 to 14 fathoms, with a patch of 12 ft. situated $1\frac{1}{2}$ cable from its eastern side. Fish, &c., can be procured at the villages.

Taskara ura, open to winds between S.E. by S. and S.S.W., has anchorage in $7\frac{1}{2}$ to $9\frac{1}{2}$ fathoms, off a small wooded islet at the head of the bay, in front of the village of Taskara. After passing the southernmost rock off Entrance Point, the East point, *Tokin san Peak*, 1,640 ft. high, with bare slopes seaward, kept N. by W. $\frac{1}{2}$ W., leads up the centre of the bay to the anchorage.

Mura Harbour is about 1 mile wide at its entrance, and extends 4 miles northward, dividing in the centre into two arms, the anchorage being in the western one, in 10 fathoms, off the village of *Hazzama*. The entrance may be recognised by two large clumps of trees on a hill, 565 ft. high, about $1\frac{1}{2}$ mile N.E. by N. from the eastern entrance point. To enter, steer in mid-channel to pass 2 cables West of Kadzura sima; a course N.N.E. from hence will lead towards the outer rock off the northern entrance point to the western arm.

Goza Harbour, 3 miles East of Mura Harbour, affords shelter from all but westerly winds. Its entrance is 1 mile wide, and thence it extends to the eastward. An inlet, named *Hamagama ura*, on the northern shore, just within the entrance, affords sheltered anchorage for small vessels, in 5 to 7 fathoms; the bar has 12 ft. water on it. Large vessels can anchor in $7\frac{1}{2}$ fathoms, sand, 9 cables within the entrance of the bay, or nearly 2 miles farther East in 14 fathoms, mud. It is high water in Hamagama ura at $6^h 15^m$; springs rise 6 ft., neaps $1\frac{1}{2}$ foot. Fowls, &c., may be procured from the villages.

CAPE SIMA, *Xima*, or *Taio saki*, is a low wooded headland, 8 miles eastward of Goza Harbour entrance. At $3\frac{1}{2}$ cables East of it is a conspicuous rock, 35 ft. high, and from hence to the S.W. several dangers lie off the coast. *O sima* and *Ko sima*, two wooded islets $3\frac{1}{2}$ cables apart, lie from $1\frac{1}{2}$ to 2 miles S.W. of *Mugi saki*, on which is a conspicuous clump of trees; long reefs and sunken rocks extend in all directions from these islets, the sea generally breaking on them, owing to the constant swell caused by the strong tides. *Outer Reef*, which always breaks, uncovers 3 ft. at low water, and lies S. by W. $\frac{1}{2}$ W.

2 miles from O sima, with *Jenja yama*, a conspicuous bare hill, 1,280 ft. high, just open West of Goma saki, N.W. by N. $\frac{1}{2}$ N. Numerous tide rips occur outside the reefs.

Northward of Cape Sima to the entrance of Matoya Harbour, a distance of 5 miles, the coast is skirted by dangerous off-lying rocks.

MATOYA HARBOUR, 5 miles North of Cape Sima, is open only to the East. Its entrance is $6\frac{1}{2}$ cables wide, but immediately within rocks extend northward from the southern shore, and contract the navigable channel to a width of $3\frac{1}{2}$ cables. The harbour is divided into numerous inlets and bays, with safe anchorage in nearly all of them. A few fowls, eggs, and fish may be obtained.

LIGHTHOUSE.—On the East extreme of *Anori saki*, the South entrance point, is a white lighthouse, 41 ft. high, showing a *bright* light, revolving every half minute, elevated 102 ft., and visible 15 miles seaward between W. $\frac{1}{2}$ N. and S.W. $\frac{1}{2}$ S.

Haka sé, a rocky patch uncovered at low water, lies just within the North point of entrance, and a quarter of a mile off shore; another patch lies 3 cables to the N.W. *Wafakano sima* lies in the S.W. part of the harbour; North and South of it are two inlets, in the northern of which, $1\frac{1}{2}$ cable wide, is the town of Matoya.

On entering Matoya Harbour the reefs on either side are nearly all visible; steer so as to pass the outer rock above water, on the southern shore inside Anori saki, at a distance of $1\frac{1}{2}$ to 2 cables, and then alter course to West for the opening leading to the town, seen South of the cliffs of Miya no saki; this will lead $1\frac{1}{2}$ cable South of Haka sé, and well clear of the rocks off a point on the southern shore. With northerly winds large vessels may find good anchorage in the northern portion of the harbour, in $5\frac{1}{2}$ fathoms, with the lighthouse bearing S.E. $\frac{1}{2}$ S., and the outer rock above water, off Miya no saki, S.W.; and with winds from the southward off the East extreme of Watakano sima, in 8 fathoms, with the N.E. point of that island bearing N.W. by W. $\frac{1}{2}$ W. It is high water, on full and change, at 6^h 50^m; springs rise 6 ft., neaps $1\frac{1}{2}$ foot.

For 5 miles North of Matoya Harbour the coast is foul, and fringed with off-lying reefs; it then suddenly turns to the N.W., and is split up into many rocky inlets, of which *Toba Bay* is the largest. Stretching hence across the entrance to Owari Bay are numerous islands and rocks.

The town of *Toba* is on the West point of a shallow creek West of Toba Bay, and off it lies the island of *Sakate*, 349 ft. high. Fish, &c., can be obtained, also wood suitable for small spars. Great caution is necessary in navigating in this locality. There is anchorage in 10 fathoms, 2 cables off a village on the South side of Sakate, and also in $6\frac{1}{2}$ fathoms between the West end of Sakate and *He sima*, three islets $7\frac{1}{2}$ cables North of Toba castle. The mountains above Toba are high.

LIGHTHOUSE.—*Suga sima*, East of Sakate, is about 2 miles long, and

rises to a height of 773 ft. Rocks extend off its East point. On its N.E. extremity is a white lighthouse, 34 ft. high, showing a *fixed bright* light, elevated 176 ft., and visible 15 miles between N.W. by N. $\frac{1}{2}$ N. and S. $\frac{1}{2}$ W.

The channel West of Momotori sima is deep, and 4 cables wide. Nearly a mile West of it is a bay, with a rock 10 ft. high in the centre; the best anchorage here is in 6 $\frac{1}{2}$ fathoms, 2 $\frac{1}{2}$ cables S.W. of the N.E. point. About a mile westward is *Ye mura*, a large village at the mouth of the *Kagamiye gawa*, and 2 $\frac{1}{2}$ miles farther on the *Minato gawa* flows into the bay. Shoal water extends off the latter, and for 1 $\frac{1}{2}$ mile northward of Toba sima there is only 4 to 5 fathoms, there being a deep channel into Owari Bay between these banks.

Momotori sima, nearly a mile North of Suga sima, is 3 $\frac{1}{2}$ miles long, and rises to a height of 552 ft. Some islets extend westward of its western end, the outermost named *Toba sima*. A ledge of 3 fathoms lies a quarter of a mile South of the peninsula at its S.E. end, and a rock, awash at low water, lies 6 $\frac{1}{2}$ cables East of the same point. There is shelter from southerly winds for a small vessel in the bay on the North side of Momotori; and there is also anchorage on the southern side of the island in 6 or 7 fathoms.

A chain of islets and rocks extends 2 $\frac{1}{2}$ miles north-eastward of the N.E. point of Momotori sima, *Odsu-kumi sima*, half a mile distant, and 268 ft. high, being the highest of the chain. Eastward of *Kodzu-kumi sima*, the easternmost, are two pinnacle rocks named *Konsa sima* and *Shimodusa sima*, with less than 6 ft. water over them, and 6 cables apart N. $\frac{1}{2}$ E. and S. $\frac{1}{2}$ W. *Konsa sima*, the northernmost, lies 8 $\frac{1}{2}$ cables N.E. by E. from *Kodzu-kumi*, and the other lies 7 cables E. by S. $\frac{1}{2}$ S. *Suga sima* lighthouse bearing S.W. $\frac{1}{2}$ S. leads well eastward of them.

Kami sima, nearly in the centre of the main entrance to Owari Bay, rises on its eastern side in precipitous cliffs to a height of 544 ft. Some rocks lie off its shores, and to the S.W. of it are *Oki no se*, two dangerous reefs, the eastern of which, nearly awash at low water, bears S.W. $\frac{1}{2}$ W., 1 $\frac{1}{2}$ mile, from the summit. The western reef, half a mile S.W. of the eastern, has a rock 2 ft. above high water on its western side. *Suga sima* lighthouse bearing W.S.W. leads 3 $\frac{1}{2}$ cables South of these reefs; *Kodzu-kumi* summit N.W. $\frac{1}{2}$ N. leads 1 $\frac{1}{2}$ cable West of them. At 3 $\frac{1}{2}$ miles E.S.E. of *Suga sima* lighthouse is *Tai sima*, a 5-fathoms shoal, which breaks in very heavy weather.

Directions.—When abreast *Matoya*, bring *Kodzu-kumi* summit to bear N. $\frac{1}{2}$ W., which will lead about a mile East of *Ishigaki iwa*, after passing which the course can be shaped to pass westward of *Suga sima* to *Toba* anchorage, or bring *Yoroi saki* in line with *Ishigaki iwa* S. $\frac{1}{2}$ W., astern, until past the East end of *Suga sima*; the South extreme of *Momotori sima* bearing W. $\frac{1}{2}$ S. leads in the deepest water North of *Suga sima* lighthouse, if wishing to proceed to the anchorages.

1. *Yo saki*, the eastern entrance point of Owari Bay, is a rocky promontory, 172 ft. high, with a sharp peak, 484 ft. high, a mile eastward of it. Some de-

tached rocks lie to the eastward, and vessels should not approach the cape within three-quarters of a mile. The tidal streams run strongly off it. Northward of it fair protection from winds between N.E. and South may be found in 7 fathoms, about $3\frac{1}{2}$ cables from the shingle beach. H.M.S. *Sylvia* rode out a typhoon here in 1877.

OWARI BAY, or *Iai Sea*, the main entrance to which lies between Kami sima and Irako saki, is about 35 miles long, North and South, and divided into three separate arms, that to the westward being the largest. According to examinations made by the German war-vessel *Elizabeth*, 1877, and the Japanese, Owari Bay has no greater depth than 22 fathoms, gradually shoaling towards its head, off which shoal water extends for about 5 miles. Large vessels, without local knowledge, should not shoal to less than 8 fathoms. Vessels can anchor in any part of the bay.

The western side of the bay shows a high mountain range, broken opposite Yakaichi. The eastern coast is low; from Moro saki to Taka me saki are hills of moderate elevation; North of Noma saki the land appears level and wooded. The *Thabor*, in 1875, proceeding in nearly a direct line from Kami sima to Yakaichi, on the West shore, obtained soundings of 12 to 25 fathoms at $2\frac{1}{2}$ or 3 miles from the East shore. A shoal of $2\frac{1}{2}$ fathoms, mud, extends about $2\frac{1}{2}$ miles from the eastern shore, S.S.W. of Onia saki village.

Yakaichi is the port where all produce from the interior is shipped. Native steam-vessels call regularly, and the place is of rising importance. *Atsuda Bay*, the head of Owari Bay, is shoal; *Fune Kata* or *Atatsu*, on its N.E. shore, is the seaport of *Nangoya*, one of the largest and most opulent cities in the empire, to which it is proposed to construct a railway, about 4 miles long, thence to be extended till it joins with the system described with Hiogo hereafter. The *Thabor* anchored in $2\frac{1}{2}$ fathoms about 5 miles from the village.

Mikawa Bay, the western arm of Owari Bay, appears to have no greater depth than 12 fathoms, and to have a remarkably even sandy bottom, and well protected from a heavy sea.

The channel between Kami sima and Irako saki is safe, but if entering at night care is necessary, as they are somewhat similar in appearance. The southern passage should not be attempted.

The Coast from Irako saki trends to the eastward for about 60 miles as far as Omai saki, and is one long stretch of sandy beach, on which are sand-hills and patches of trees. *Hamana Ko*, the entrance to which is nearly midway between, is an extensive shallow sheet of water, only admitting junks at high water; the coast westward of it is formed of remarkable yellow sandy cliffs. On the eastern side of the entrance is the town of *Mayesaka*, and 8 miles inland is *Hamamatsu*, a large town and telegraph station. *Tsurin gawa*, 12 miles eastward of the entrance, is a river of some size, and off its entrance, named *Kakesuka minato*, is a spit, under the lee of which, during westerly winds, good anchorage may be found in 7 to 10 fathoms. The water off this

coast is much discoloured. During the winter months, October to March, on this coast westerly winds prevail, accompanied by fine clear weather.

OMAI SAKI is a dark wooded bluff, 150 ft. in height, terminating a very sandy shore with high beaches, backed by wooded hills. It may also be recognised by two remarkable white patches, only one of which is visible from East or West. Shelving rocks, dry at low water, extend $3\frac{1}{2}$ cables from high-water mark. A white *beacon*, bearing a ball, stands about three-quarters of a mile N.W. of the cape.

LIGHTHOUSE.—On a sand-hill on the S.W. part of Omai saki is a white tower, 71 ft. high, showing a *bright* light, *revolving* every half minute, elevated 173 ft., and visible 19 miles seaward between N.E. and W. by N. $\frac{1}{2}$ N.

Nearly 2 miles East of the southern point of Omai saki are *Lady Inglis Rocks* or *Gozen iwa*, on which the vessel *Lady Inglis* was wrecked in 1859. They consist of a reef one-third of a mile long, North and South, composed of isolated rocks, which usually uncover 4 ft. at low water springs; they do not always break at high water, but the locality is marked by tide rips. There is a deep channel between them and the shore, but a small rock, awash at low water, lies nearly midway between.

Good shelter from westerly winds between North and S.W. may be found North of Omai saki, in 6 fathoms, good holding ground. *North Rock*, awash at high water, lies N. by W. $\frac{1}{2}$ W., 5 miles from Lady Inglis Rocks, and about 1 mile off shore.*

GULF OF SURUGA (the *Tutomi Gulf* of former charts), the waters of which wash the western shore of the peninsula of Idsu, is 35 miles deep, and 30 miles wide at its entrance, and, with the exception of Lady Inglis and North Reefs, is thought to be free from any impediment to navigation. The water in it is very deep, no bottom at 250 fathoms being found at mid-entrance, none at 160 fathoms midway across near the head of the gulf, and none at 110 fathoms at a little more than a mile from the western shore.

The eastern side of the gulf, the shore of the Idsu peninsula, is generally a belt of cliffs, broken, however, into several deep-water havens, which, though small, afford good anchorage, but for sailing vessels with a foul wind are all difficult of access, and the entrances of those harbours that are known, Tago, Arari, Heda, and Yeno ura Bays, on the Idsu shore, are too narrow to admit

* The barque *Oleander* was reported, in 1880, to have struck on a rock 5 miles N.E. by N. $\frac{1}{2}$ N. from Omai saki. This rock was searched for without success by Lieut. R. Hoskyn, R.N., in 1881.

Portsmouth Breakers.—Capt. Foote, U.S. frigate *Portsmouth*, 1858, reported that he nearly lost his vessel on a reef about 35 miles in a south-westerly direction from Simoda, and 13 miles from the nearest land, but no indication of such a shoal has since been found, though a remarkable discolouration of the water has been seen. It seems highly probable they are either identical with Lady Inglis Reef, or that a shoal of fish or a current overfall caused the disturbance in the water, which gave birth to the report.

of much manœuvring. The western side appears less precipitous, but equally steep-to. The shore at the head is low and sandy, with numerous villages. Three large rivers flow into the N.W. side of the bay.

FUSI YAMA.—At the head of the gulf is Fusi yama, 12,450 ft. high, the highest mountain in Japan, and although its summit is 13 miles inland, it appears in clear weather to rise nearly abruptly from the beach. It is held to be sacred by the Japanese, and is the object of pilgrimage. The first Europeans who ascended it were a party of eight Englishmen, at the head of whom was Sir Rutherford Alcock, C.B., the British Envoy and Plenipotentiary in Japan, September, 1860. The crater on the summit is about 1,000 yards long, 600 yards wide, and 350 yards deep. Its position is lat. $35^{\circ} 21' N.$, long. $138^{\circ} 44' 30'' E.$ *

SHIMIDZU HARBOUR, surveyed by H.M.S. *Acton*, in 1861, is formed by a low tongue of land of considerable width, stretching out in a north-easterly direction from the N.W. shore of the gulf. It affords good shelter in 10 to 15 fathoms, soft mud, with an inner anchorage at its head, available for small craft, in which, if required, they could be beached for repairs. A small river empties itself at its head. It is high water, on full and change, at $7^h 30^m$; springs rise 7 ft.

This tongue of low land is well covered by sugar plantations and villages. Its extreme North point, of sand and shingle, is steep-to, and vessels running for the harbour may safely skirt the beach, and rounding the point at 2 cables, anchor as convenient. The town is situated at the South end of the harbour, and is the centre of a large and productive sugar-growing district.

Large spars, pine, and fir (the latter having a very short grain), small rough spars, small pieces of particularly hard oak, also sugar of a very fair quality, a little flour, a few fowls, fish, and vegetables, and water can be obtained. There was no coal, but charcoal, when attainable in sufficient quantities, is admirably adapted for steaming purposes.

YENO URA,† an excellent harbour, in the N.E. angle of Suruga Gulf, is 1 mile long, North and South, and 8 cables deep. *Ara sima*, a wooded island, affording shelter from westerly winds, lies off the South point of entrance, and there is a small monument on the North point. The soundings in the bay are deep, 20 to 30 fathoms, and it is open to the West, but there is good shelter from all winds in a small bay in its northern part, where the depth is 13 fathoms, over fine sand. In steering for this small bay, keep midway between its western shore and the cliffs on the eastern. A town stands on the western shore, and a small river flows into the bay, but as water is obtained from it

* A very interesting account of this ascent, and of Japanese matters in general, is given in the *Journal of the Royal Geographical Society*, 1861, pp. 322–356.

† The description of Yeno ura, Heda, Arari, and Tago Bays, is chiefly by Lieut. Elkie, of the Russian frigate *Diana*, 1853–55.

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ly by Lieut. Elkin,



with difficulty, on account of its shallowness, it is best to procure it from the town wells. There is abundance of fish and vegetables. The tide rises about 4 feet.

Heda Bay, on the East shore of the gulf, in lat. $34^{\circ} 58\frac{1}{2}'$ N., is 8 cables in extent, N.W. and S.E., 4 to 9 cables wide, with a depth of 8 to 22 fathoms, over fine sand. The entrance, a quarter of a mile wide, and open to the N.W., is to the northward of a low sandy spit extending half a mile northward from the southern shore. It is a safe and accessible anchorage, and is sheltered on all sides by high mountains. There is a village in a valley at its head; fish and vegetables are abundant. The tide rises $5\frac{1}{2}$ ft.

Arari Bay, sheltered from all winds, but only fit for small craft, lies 9 miles southward of Heda Bay. It is 4 cables in extent, North and South, and 2 to 6 cables across, with depths of 6 to 12 fathoms, over fine sand. The shores of the bay are mountainous. Water may be conveniently obtained from the village on the eastern shore; fish is plentiful. The entrance, open to the N.W., is only half a cable wide; in entering, keep in mid-channel, and when a small island opens, steer between it and the sandy point to the S.W.

Tago Bay, about a mile South of Arari Bay, is 4 cables in extent, North and South, and half a mile wide. It is sheltered from all winds, with depths of 12 to 20 fathoms, soft mud bottom. There is a small town here, and water can be obtained from the wells. Fish and vegetables can be procured.

In steering for the entrance, which is open to the N.W., two islands (lying half a mile W.N.W. from the South point of entrance) will be seen, with rocks and breakers extending to the southward from them. Pass northward of these islands, between them and the mainland.

These four bays just described will serve as a refuge from S.W. winds, which cause a great swell in Suruga Gulf. Their coasts are wooded and mountainous, attaining the height of 1,000 ft. The entrances must be approached fearlessly, for the high coast conceals them, and the bays only open when within a mile.

THE GULF OF YEDO.

The **GULF of YEDO**, connected with Yedo Bay by Uraga Channel, is bounded on the West by the mountainous peninsula of Idsu (terminated to the southward in Cape Idsu), and on the East by that of Awa, the southern point of which is 52 miles distant.

IRO-O SAKI, or **Cape Idsu**, is a fine bold rocky headland, and may be recognised by a conspicuous white cliff, $3\frac{1}{2}$ miles N.W. of it, and a conical rocky peak a few miles farther in the same direction, forming the S.W. extreme of the peninsula. The summit of Cape Idsu is a hill 250 ft. high, which falls into two small ridges to the sea. There is an islet 50 ft. high a quarter of a mile off

North Pacific.

5 N

the shore, 1 mile West of the cape. For 3 miles E.N.E. the coast is fronted with sunken rocks.

LIGHTHOUSE.—On Iro-o saki is a white lighthouse, 24 ft. high, showing a *fixed red* light, elevated 185 ft., and visible 8 or 10 miles seaward between E. $\frac{1}{2}$ N. and W. by N. $\frac{1}{2}$ N.

ROCK ISLAND and LIGHTHOUSE.—Rock Island, or *Mikomoto*, is about 104 ft. high, and a third of a mile in length, with precipitous shores and an uneven outline; it bears E. by S. $\frac{1}{2}$ S. about 5 miles from Cape Idsu. On it is a white lighthouse, 72 ft. high, showing a *fixed* light, elevated 164 ft., and visible 19 miles. The light is *bright* seaward, but *red* inshore over the dangers, between N.W. and N. by E., the latter bearing leading into Simoda Harbour.

Between this rock and the main land are the *Yokone* and five other rocks, among which the junks freely pass; but a vessel should not attempt to run inside Rock Island at night. The channel between Rock Island and Uona Rocks carries irregular soundings of 9 and 14 to 30 fathoms; a rocky 4-fathoms patch lies $6\frac{1}{2}$ cables N. $\frac{1}{2}$ W. from the lighthouse. The tides are regular, the flood setting W.S.W., $1\frac{1}{2}$ mile an hour, the ebb E.N.E., from 2 to 3 miles per hour; the force of the ebb tide being considerably augmented by the general north-easterly current.* The vicinity of Rock Island is remarkable for the exceptionally bad weather frequently experienced in its neighbourhood.

Yokone or Uona Rocks, two in number, though they generally appear as one, bear N. by W., distant 2 miles from Rock Island; the larger is about 25 ft. high. Five other rocks occupy a triangular space of a mile from W.S.W. to N.N.W. of Yokone Rocks, the northern and southern of these small ledges being nearly awash. A reef also extends $3\frac{1}{2}$ cables towards them from Tohadgi Point to the N.W. of Yokone Rocks. There is deep water between all these rocks.

SIMODA HARBOUR† is on the eastern side of the peninsula of Idsu, 6 miles N.E. of Iro-o saki. To the northward of the harbour a high ridge intersects the peninsula; and South of this, all the way to the cape, it is broken by innumerable peaks of less elevation.

* The worst part of the coast for tide-rips is in the vicinity of Rock Island. Nine times out of ten, in passing here, these disagreeable things will be met with. They sometimes take place in calm weather. The calm sea suddenly seems lashed into fury. The waves rise like walls, so near together that a vessel has no time to rise and fall, but has to flounder through in the most uncomfortable manner. Large ships have their decks washed, and their engine-gear severely tested. Small ones get literally thumped and knocked about. If an unlucky sailing ship gets drifted into one of those troublesome patches in a calm, she is very roughly handled; and to small vessels they are exceedingly dangerous.—*Capt. H. C. St. John, H.M.S. Sylvia.*

† The harbour was surveyed, in 1854, by the officers under Commodore Perry, U.S.N., and the directions which follow are based upon those drawn up by Lieut. Wm. L. Maury, U.S.N., combined with later information.

Susari or *Vandalia Bluff*, the East point of entrance, will be known by a grove of pine trees on the summit of the bluff, and the village of *Susaki*, which is about a third of the way between it and Cape Diamond. The entrance is $8\frac{1}{2}$ cables wide, but a short distance within it narrows to half a mile. The town stands on the West shore, and *Kaki-saki* village on the East. Wood, water, fish, &c., may be procured.

Cape Diamond, or *Tsumigi saki*, is $1\frac{1}{2}$ mile eastward of the entrance, and immediately off it is a rocky islet, and northward of it the bay of *Sirahama*, which, as it has several sand beaches, may be mistaken for Simoda Harbour; but, on approaching this, Cape Diamond will shut in Cape Idsu, Yokone Rocks, and Rock Island to the southward, whilst in Simoda Road they are visible from all points.

Simoda (which means "low field") was the port selected, with Hakodate at the South end of Yezo, as the first Treaty Ports by the American Expedition; and is, therefore, of much interest to the commercial world. The treaty was signed on March 31st, 1854.*

Oki Hibi *sima*, or *Centre Island*, lying nearly in the middle of Simoda Harbour, bears N. $\frac{3}{4}$ E., $5\frac{1}{2}$ miles, from Rock Island, and N. by E. $\frac{1}{4}$ E., $3\frac{1}{2}$ miles, from Yokone Rocks. It is high, conical, covered with trees, and a cave passes entirely through it. *Hibi* *sima*, or *Buisako Islet*, a quarter of a mile to N.N.E., is about 40 ft. high, and wooded.

Oonagare (Southampton) and **Supply Rocks** are two hidden dangers in Simoda Harbour. Southampton Rock, in mid-channel, S. by E. $\frac{3}{4}$ E., 2 cables from the South point of Centre Island, and N. $\frac{1}{4}$ W. from Vandalia Bluff, about three-fourths of the way between it and Centre Island, is about 25 ft. in diameter, has 2 fathoms water on it, and was marked by a *white* spar buoy. Supply Rock, lying S. by W. a short distance from Buisako, is a sharp rock, with 11 ft. water on it, and was marked by a *red* spar buoy. The East end of Centre Island in line with the West end of Buisako leads westward of Southampton Rock.

In the outer road, or mouth of the harbour, a disagreeable swell is sometimes experienced; but inside Southampton Rock and Centre Island, vessels are well sheltered, and the water comparatively smooth. Moor with open hawse to the S.W.

When this harbour was surveyed, in 1853-4, the bottom throughout was mud; but a few months subsequently the harbour was scoured out to its granite foundations by the back-sweep of three huge waves which in succession rose over the tops of the highest trees, and left the bay nearly empty. Large junks were thrown some distance inland, and the Russian frigate *Diana* left all but a total wreck.† It was always considered an unsafe and exposed bay when the

* See Commodore Perry's "Narrative," pp. 440, 453, &c.

† The tremendous convulsion here alluded to is one of the most remarkable on record.

anchorage ground was tolerable, being open to South and S.S.W., the direction from which the heaviest winds blow. H.M.S. *Sylvia* rode out a heavy southerly gale here, and Capt. St. John reports the holding ground to be excellent.

It is high water in Simoda Harbour, on full and change, at 5^h 0^m; springs rise 6 ft., mean rise 3 ft.

Directions.—If intending to anchor at Simoda, pass Rock Island at a mile, when the harbour will be in full view to the northward. Standing in from this island a vessel will probably pass through a number of tide-rips, but no soundings will be obtained with the hand-lead until near the entrance, when the depth will be 14 to 27 fathoms. Should the wind be from the northward, and fresh, a sailing vessel should anchor at the mouth of the harbour until it lulls or shifts, or until she can conveniently warp in, as the wind is usually flawy, and always baffling.

Approaching from the N.E. or eastward, a vessel can pass on either side of Vries Island, from the North and South points of which, Cape Diamond (Tsumigi saki) bears respectively W.S.W. and West, distant about 21 miles. Between Vries and Simoda no dangers are known to exist; but the currents are uncertain, and strong near the coast.

Should Vries be obscured by thick weather, before reaching Cape Diamond* endeavour to sight Rock Island, for there are no conspicuous objects on the main land by which a stranger can recognise the harbour at a distance, and the shore appears as one unbroken line. To the westward of the harbour there are several sand beaches, and three or four sand-banks; these can be plainly discerned when within 6 or 8 miles, and are good landmarks. Off the village of Susaki, at a third of a mile from the shore, is a ledge of rocks upon which the surf always breaks. Give them a berth of 2 cables.

Admiral Count Pontiatino has given a brief statement of its effect on the *Diana*. On Dec. 23rd, 1854, at 9½ a.m., without any previous indication, the shock of an earthquake occurred, which lasted two or three minutes, shaking the vessel very much. At 10^h a huge wave entered the bay, and, rushing on the shore, washed nearly every building in Simoda away. A second wave rushed in five minutes afterwards, and at 10½ a third wave left only sixteen out of one thousand houses standing. From 10½ till noon the water sank and rose so extraordinarily that the depth varied from 8 feet to 40 feet depth at her moorings, and she was flung about and turned no less than 43 times round her anchor in thirty minutes. After this the agitation diminished, but continued for some hours. The *Diana* was much injured, and her crew, on January 18th, were compelled to leave her. She was taken in tow by 100 junks to carry her into the bay, but, after proceeding a few miles, a small white cloud appeared, on perceiving which the Japanese fled panic-stricken, and cast her adrift. In a very short time a violent storm arose, in which she foundered. The waves which were raised reached the coast of California a few hours after, and were registered then.

* Commander C. Bullock, R.N., observed, October 6th, 1866, some submarine jets, apparently of steam, about 10 miles N.E. of Cape Diamond, and 2 miles off the land.

Approaching Simoda from the S.E. pass westward of Kosu sima, from which the harbour bears N. by W. $\frac{1}{2}$ W., distant about 27 miles.

From Iro-o saki the coast rounds in a N.E. direction 26 miles to *Futo saki*, its general features being high, rocky, and even, having near Simoda a few sandy beaches. Between Simoda and *Futo saki* the coast is bold of approach. Over it the mountain *Amagi yama* rises to 4,700 ft., and on the N.E. ridge is a conspicuous dome-shaped hill.

From *Futo saki* the coast trends more to the northward, forming a slight bend to *Fuku-ura*, where it becomes more broken, but maintains its bold features under a lower range, the two highest points of which are elevated 2,970 and 2,460 ft.; under the latter is a round hill with a large quarry. From these hills the long low promontory of *Manatsuru*, bordered by vertical cliffs, stretches to the eastward, and off its extreme point is a rock 20 ft. high. On its West side is the open bay of *Fuku-ura*. From thence the coast assumes a lower elevation, and gradually bending round to the eastward forms the treacherous Bay of Odawara.

To the northward of *Futo saki* are some small islands, the largest of which, *Itatsu sima*, 9 miles distant, and 120 ft. high, is about 3 miles off shore, and to W. by N. of it is the bay of *Ajiro*. This bay is open to N.E. winds, and anchorage may be obtained off the South point, on which is a village.

Atami Bay, 2 $\frac{1}{2}$ miles North of *Ajiro*, may be distinguished by a small white cliff to the northward; the water in the bay is deep, there being no bottom at 20 fathoms at the entrance; a natural breakwater forms a shelter for small vessels in 5 to 13 fathoms. Anchorage may be obtained in 7 fathoms, black sand, with *Itatsu sima* bearing S.E. $\frac{1}{2}$ E., and a rock off the South point S. by E. $\frac{1}{2}$ E.

At *Atami* is a hot sulphur spring, an immense column of steam and hot water being ejected from the vent about six times a day. These baths are frequented by the Japanese, and there is a small village of 200 or 300 houses.

ODAWARA BAY, or *Sagami ura*, from the lowness of the land at its head, has sometimes been mistaken by strangers for *Uraga Channel*. When past *Vries Island*, however, the channel will be recognised by *Su-no saki*, its East point of entrance, being comparatively high (645 ft.), whereas *Cape Sagami*, the southern part of the peninsula of that name on the West side of entrance, is not more than 70 ft. high, with the exception of a small hill of 354 feet elevation on the centre of its South part, named *Tree Saddle*, from two conspicuous clumps of large trees on its summit. The *lights* will indicate it by night.

Care must be observed when steering for *Uraga Channel* not to be drawn into this bay, as a considerable indraught has always been experienced, and the low land at the head, contrasted with the high land to the westward of it, looks so distant, that the bay has often been mistaken for the channel, and the error only discovered when deeply embayed, and probably close to some of the

reefs which skirt the head and East side of the bay, the most dangerous of which is Macedonian Reef.

Yeno sima, 220 ft. high, is the eastern extreme of the low shore fronting the plain at the head of Odawara Bay, which is said to be very shallow, although there is 117 fathoms at 3 miles distance. *Uba sima*, a large reef, marked by a peaked rock 30 ft. high, lies 1 mile off the beach, 2 miles to the West of Yeno sima, and a similar reef lies three-quarters of a mile farther N.W. Yeno sima has bold high cliffs of a light colour, which makes it very conspicuous, and a flattish summit with a few large trees. On the S.E. it cannot be approached within three-quarters of a mile, as an extensive reef skirts that part of the island. The island is connected with the main, where the Sagami Hills terminate, by a narrow ridge of shingle, which covers at high water, to the westward of which a small river disembogues. There is generally a heavy ground swell at this part of the bay.

The white pointed cliffs of Kotzbomura will be seen $2\frac{1}{2}$ miles East of Yeno sima (the coast between being skirted by sunken reefs), and are a guide to the only anchorage on the North side of Odawara Bay.

Horino-utsi-mura.—The bay directly East of the white cliffs is full of reefs, and cannot be approached, but Horino-utsi-mura Bay, the bay next S.E., and to the North of *Impérieuse Bluff*, is a fair temporary anchorage, though exposed to West and S.W. winds.

A reef, 3 cables long, extends from a low point at the foot of *Impérieuse Bluff*. To the N.W. of this, a chain of rocks runs out westward from the low point just North of the bluff, their centre part being marked by a large white-topped rock 20 ft. high; the outer rock is very small, but uncovered. At 3 or 4 cables North of this chain there is anchorage in 4 to 8 fathoms. The *Dore* and *Leven* anchored here, the rocks breaking the heavy swell from the South.

Macedonian Reef lies off the East side of Odawara Bay, at 4 miles N.N.W. of Joka sima lighthouse. It dries in many places at low tide, and, except in the smoothest water, always betrays itself by a breaker when covered; but if it be not visible, do not bring the lighthouse to the southward of S.E. by S. $\frac{1}{4}$ S. until the South end of the first range of hills, 700 ft. high, North of Cape Sagami, bears E. $\frac{1}{4}$ N. The ranges of Sagami Peninsula terminate in *Impérieuse Bluff*, 500 ft. high, wooded, and very conspicuous. The West slope of the bluff N. by E. will lead three-quarters of a mile outside the reef.

ASINA BAY.—Vessels embarrassed in the vicinity of Macedonian Reef may find an anchorage about $1\frac{1}{2}$ mile N.E. of it in Asina Bay, in 4 to 8 fathoms, good holding ground, and sheltered from all points except westward, but only a case of extreme emergency would justify a stranger using it. There are some rocks off the North side of the bay, but they show, and are easily avoided by keeping mid-channel.

Ko-ajiro Bay.—There are two or three excellent havens for small craft and junks on the West shore of Sagami Peninsula, to the southward of Macedo-

nian Reef. Ko-ajiro, the largest of these, is 2 miles North of Joka sima lighthouse, or three-quarters of a mile N.E. of the *Moroisi*, a long reef of rocks, which extend off the point N. by W. $\frac{1}{2}$ W. of the lighthouse. There is no difficulty in entering. A reef stretches off the North point of entrance, half-way across the entrance, with a 4-fathoms channel on the bold South shore. Farther in a perch marks the end of the shoal from the South shore. Inside this is secure anchorage in 3 fathoms.

Lighthouse.—*Joka sima* is 1 mile long, and skirted with reefs. On its West end is a white lighthouse, 25 ft. high, showing a *fixed green* light, elevated 106 ft., and visible 9 miles. It is not visible when bearing westward of N.W. $\frac{3}{4}$ W.

Awa Peninsula, although mountainous, is less so than Idsu, and possesses much larger tracts of arable land, all of which is carefully cultivated. Its West coast is more sinuous than the opposite shore of Yedo Gulf, but only one of the bays, *Tateyama*, formed in it, affords fair anchorage.

NOSIMA SAKI and LIGHTHOUSE.—Nosima saki, the southern extremity of Awa Peninsula, is low, and at 2 miles East of it dangerous shoals extend about $1\frac{1}{2}$ mile from the shore. On Nosima saki is a white lighthouse, 99 ft. high, deserving of especial notice as being one of the first of its kind erected on European principles in Japan. It shows a *fixed bright* light, elevated 133 feet, and visible 17 miles seaward between E. by N. $\frac{1}{2}$ N. and W. $\frac{1}{2}$ N.

Mela Head, 450 ft. high, is $3\frac{1}{2}$ miles eastward of the lighthouse, the coast between being skirted with rocks. The dangerous *Mela Ledge* lies $1\frac{1}{2}$ mile off it, and is marked by heavy breakers in a swell.

SU-NO SAKI, on the East side of the entrance of Uruga Channel, 5 miles N.W. of Mela Head, when seen from the southward appears as a block of small hills, rather conical in profile, the highest, *Hazama*, being elevated 645 ft. The point is low, with the exception of a small elevation, at the N.W. corner, on which is an old fort. There is a heavy tide-rip off it, but no dangers at a greater distance than half a mile from the shore.

TATEYAMA BAY.—The coast from Su-no saki doubles back abruptly to the eastward 4 or 5 miles before taking its northerly trend, forming, with *Daibo saki*, the point next North of Su-no saki, the Bay of Tateyama, in which shelter and good holding ground may be found in southerly and easterly gales, but it is quite exposed to the westward.

The best anchorage is in about 7 fathoms, a quarter of a mile eastward of Taka sima, the easternmost of the two small wooded islands on the South side, with the West extreme of Daibo saki N.W. by N. $\frac{1}{2}$ N., and *Siro yama*, a hill 290 ft. high, S.E. by S. $\frac{1}{2}$ S. This hill is the North extreme of some rising ground in the S.E. corner of the bay. This position is well sheltered from North, round East, to W. by S., but should there be any appearance of the wind veering westward, an early departure is recommended, as a heavy sea quickly tumbles in.

The *Acteon* obtained fish, fowls in small quantities, and water, from a village at the base of Siro yama.

Numerous small off-lying rocks stud the coast from Su-no saki as far northward as Kanaya Point, the outer of which is *Ghibu-isi* or *Black Rock*, about 20 ft. high, lying N. by W., $1\frac{1}{2}$ mile, from Daibo Point, and a mile off shore; near it are several small rocks which only uncover at low water. Most of these rocks show above water, and no danger is at present known to be a greater distance than a mile off shore. *Kanaya Point* bears nearly East of the Tree Saddle on Sagami Peninsula, and is at the termination of the sharp well-defined ridge of the *Miogani yama*, a fine dome-shaped mountain, elevated 1,096 ft. To the northward of these hills the country (*Kadsusa*) becomes much lower, and a few miles north-eastward of Futsu saki, the point off which Saratoga Spit extends, it becomes an uninteresting dead flat, encircling the head of Yedo Bay.

DIRECTIONS.—In navigating the south-eastern coast of Japan, after passing Satano misaki, in Van Diemen Strait, if the weather be thick, the vessel's position should be well ascertained before she is hauled to the E.N.E., as her course is parallel to the high land for about 20 miles from the pitch of the cape. It should also be borne in mind that the Kuro siwo current on this coast runs to the E.N.E. at the rate of from 40 to 100 miles a day; it may, however, be entirely checked for twenty-four hours by a N.E. wind, when it may be again expected to resume its former course, and possibly run with greater rapidity than usual for one or two days.

Vessels, therefore, bound to the eastward must allow for this current, and should keep not more than 30 miles off shore, so as to be enabled, if necessary, to verify their reckoning by sighting the land,* as also to avoid being set to the southward, as is sometimes the case when approaching Cape Idsu, and with light winds it is difficult to regain the coast. In the summer season the north-easterly current is not to be expected in the vicinity of Cape Idsu.

Vessels from the Gulf of Yedo bound for Kii Channel, after passing Rock Island, should take an in-shore passage, steering for Omai saki, and thence for Oö sima, thus avoiding the strength of the Japan Stream.

In approaching the Gulf of Yedo, the remarkable high mountain Fusi yama, a lofty and symmetrical truncated cone of 12,450 ft. elevation, and so different in form from any other land in its vicinity, cannot fail to be of great service in directing vessels either to Simoda or Yedo. In clear weather it is the first distant land seen, and generally to the north-eastward, visible at times upwards of 100 miles. Iro-o saki, or Cape Idsu, is in line with it when bearing North. When bound from the southward and westward endeavour to make Cape Idsu, and if the weather is at all clear, the chain of islands off the Gulf of Yedo will

* It is recommended to make Siwo misaki, the East point of entrance to Kii Channel, whenever practicable.

at the same time be plainly visible. Omai saki, the West point of entrance to Suruga Gulf, cannot be mistaken for Cape Idsu, the former being low, with a sandy beach and low sand-hills, with occasional patches of trees; whereas the cape is high and rocky, and its summit generally hidden in the clouds. Rock Island being low, unless the weather is clear, will not be seen until long after this cape and Vries Island are made. By night the *lights* form good guides.

Between Kii Channel and Rock Island westerly winds are most frequently met with, falling light when the latter place is passed; and often on rounding Cape Sagami a strong N.E. wind is encountered.

URAGA CHANNEL, connecting the gulf with the bay of Yedo, is remarkably clear of hidden danger. On its West side, about 1 mile off shore, lie *Ashika sima* or *Plymouth Rocks*, always uncovered, and easily seen; close to them is a sunken rock, and in their vicinity, off Senda saki and Uruga, are several rocky patches extending some distance from the shore. The mariner should bear this in mind, and as Kaneda Bay has also some foul ground in it at nearly a mile from the shore, it would be prudent to give this locality a good berth in passing.

LIGHTHOUSE.—*Sagami misaki*, the western cape at the entrance to Uruga Channel, was described on page 829. A $4\frac{1}{2}$ -fathoms patch lies 7 cables S.E. of the North extreme. On *Tsurugi saki*, its S.E. point, stands a white tower, 37 ft. high, showing a *flashing* light every 10 seconds, elevated 110 ft., and visible 16 miles. The light is *bright* seaward between W. by S. and N.E. $\frac{1}{4}$ E., and *red* over Plymouth Rocks between N.E. $\frac{1}{4}$ E. and N.E. by N. $\frac{1}{4}$ N.

Kaneda Bay, between Sagami misaki and Senda saki, is 4 miles wide, and affords excellent anchorage with winds from South, round by West and North, to N.E., in 10 to 3 fathoms, sand, good holding ground. *Oki-no sima*, 3 ft. above high water, is a black rock in the S.W. portion of the bay, with foul ground between it and the shore. *Mits iso*, a cluster of rocks three-quarters of a mile from the northern shore of the bay, cover at high water. A 6-ft. shoal lies W. by S. $\frac{1}{4}$ S. 7 cables from the southern of these rocks, and another of 9 ft. lies W. by S. $\frac{1}{4}$ S., nearly 1 mile from the same rock. These dangers necessitate great caution when anchoring.

Ashika sima, or *Plymouth Rocks*, are two dark rocks 5 ft. above high water, lying N.E. $\frac{1}{4}$ N., $5\frac{1}{2}$ miles, from Sagami misaki, and S. by W. $\frac{1}{4}$ W., $3\frac{1}{2}$ miles, from Kuwan-on saki lighthouse. *Kata sima*, awash, lies S.E. by E. $\frac{1}{4}$ E., nearly 1 cable, from the eastern rock, and was marked by a red *beacon*.

Senda saki shows in steep white cliffs, the termination of the range from Take yama. It has a dismantled fort at the summit of the cliffs, and is surrounded by detached rocks, the eastern portion projecting out in a spit, the outer edge, of 21 ft., lying E. by S. $\frac{1}{4}$ S., 6 cables, from the point, leaving only a passage of 3 cables between it and Ashika sima. The outer detached rock, awash, lies S.S.W., $9\frac{1}{2}$ cables, from Senda saki.

North Pacific.

Kurihama, the bay North of Senda saki, is foul, and has a sandy beach at its head, the end of a long plain which is drained by a river running into a lagoon. *Kadausa saki*, the North point of this bay, is terminated by a conical mound, *Shendora*, 69 ft. high, from which a ledge of rocks extends S.E. $\frac{1}{2}$ S., $4\frac{1}{2}$ cables. From this to Tomio saki the ground is foul nearly 4 cables off shore.

Uraga,* a thriving village, and clearance port of the junk trade to Tokio (Yedo), has a good harbour for vessels drawing less than 9 ft. *Tomio saki*, the South point of entrance, is low, with a Japanese lighthouse and a memorial stone near its extreme, which, when in line, lead clear of *Kayama* or *Elmstone Rock*, a dangerous 12-ft. rock, lying nearly 1 mile S. by W. $\frac{1}{4}$ W. from Kuwan-on saki lighthouse. A 12-ft. shoal lies E. $\frac{1}{2}$ S., 3 cables from the light, and there is less than 3 fathoms at 150 yards S.E. from it.

Miojin saki, the North point, is a bold bluff, surmounted by a battery. From it to Kuwan-on saki the land is undulating, with villages in sandy bays. The whole of this coast is foul for half a mile from the shore. *Ashika sima* kept bearing S.W. by S. $\frac{1}{2}$ S., until Kuwan-on saki light bears N.N.W., will lead clear eastward of *Kayama*.

LIGHTHOUSE.—*Kuwan-on saki*, or *Kanon saki*, is a steep headland, over which is a conical hill 272 ft. high. On the slope of this hill is a square white lighthouse, 51 ft. high, showing a *fixed bright* light, elevated 178 ft., and visible 14 miles. A *red* ray is shown from the same lantern between South and S. by W. $\frac{1}{2}$ W. over Plymouth Rocks. Also from a window, 32 ft. below, a *fixed red* light, visible 7 miles, is shown between N. $\frac{1}{2}$ W. and N.N.E. over Saratoga Spit.

YEDO BAY is about 28 miles deep in a N.E. and S.W. direction, 20 miles wide at its broadest part, with excellent holding ground, and capable of sheltering the fleets of the world. A careful attention to the lead will give warning of the approach to the margin of the bank of fine sand which skirts its shores.

From Kuwan-on saki lighthouse to *Rubicon Point*, a mile distant, the coast is slightly indented, having sandy bays between the points. Rocks extend 1 cable off *Rubicon Point*. *O-tsu-no ura* is a deep bay with a sandy beach, having numerous villages. There is shallow water in its eastern portion, the outer shoal of 12 ft. lying N.W. by W. $\frac{1}{2}$ W., $8\frac{1}{2}$ cables from *Rubicon Point*. In the centre of the bay is a shoal, $4\frac{1}{2}$ cables long and 3 cables broad, having 9 feet on the North and 13 ft. on the South edge, with depths of $2\frac{1}{2}$ to $4\frac{1}{2}$ fathoms between. The North edge lies S. $\frac{1}{2}$ E., 4 cables from *Saru sima*.

Saru sima, or *Perry Island*, 198 ft. high, is cliffy, with a wooded flat sum-

* *Uraga* or *Reception Bay* is remarkable as the place where the American squadron first had communication with the envoys of the Japanese Emperor, July 14, 1853, which led to the treaties opening the country to foreign commerce. (See Narrative of the American Squadron, under Commodore M. C. Perry, U.S.N., 1866, pp. 266—303).

mit, and has shoal water all round it. *Kitsune no se*, E. by S. $\frac{3}{4}$ S., $3\frac{1}{2}$ cables from the South point, is a rock, covering at high water, and West, 3 cables from the same, lie three rocks, awash at high water. Between these rocky patches there is shallow water. No vessel should attempt to pass between Hana-rete and Saru sima.

Hana-rete, 94 ft. high, to the N.W. of Saru sima, is a green conical mound, sloping down to dark rugged rocks. Between it and the western end of O-tsu-no ura the coast is composed of a series of white cliffs, with shingly beaches intervening. *Ko-naga ura*, South of Hana-rete, is a deep bay, off the South point of which is a conical islet 78 ft. high, $3\frac{1}{2}$ cables S.E. by S. $\frac{1}{4}$ S. from which lies a rock, dry at low water, with foul ground between it and the shore. A rock, awash at low water, with a red *beacon* on it surmounted by a cage, lies N.E. by E., $3\frac{1}{2}$ cables from Katshiriki, the North point of the bay. Vessels should not attempt to pass inside it.

YOKOSKA HARBOUR, over 1 mile in depth, with a general breadth of $3\frac{1}{2}$ cables, is the eastern of two large inlets, and may be easily recognised by *Ha sima*, 144 ft. high, off its N.E. point, and by a remarkable clump of trees, 355 feet above the sea, known as *Azuma*, on the highest hill of the promontory separating it from F'ka ura, the western bay. The shores are a series of cliffs and indentations, the points generally being marked by white stone *beacons*. At its head is the principal dockyard and arsenal in Japan; here are two docks, with all the necessary works for repairing and building ships and engines, the houses for the officials being situated on a plain that joins O-tsu-no ura. On one of the factories is a clock-tower, visible from that bay. The inner part of the harbour is formed by two breakwaters.

Docks.—The South dock is 377 ft. long, 72 ft. broad, with a depth of $22\frac{1}{2}$ ft. on the sill at spring tides. The North dock is $288\frac{1}{2}$ ft. long, $65\frac{1}{2}$ ft. broad, and has 17 ft. water on the sill. From the outer anchorage the turn into the docks is rather abrupt. A new dock of considerable length, capable of taking vessels drawing 25 ft., was to be completed during 1884. There are also two building slips, for vessels of about 800 tons.

A red *buoy* marks the northern edge of a 9-ft. patch, midway between Katshiriki Point and Ha sima, and $3\frac{1}{2}$ cables from the shore. Off the eastern points of Yokoska there are spits, having 10 to 12 ft. on their outer edges; those off Eyi yama Point extending N.N.E., $2\frac{1}{2}$ cables, and N.W. $\frac{1}{4}$ W., $1\frac{1}{2}$ cable. The outer end of the latter is marked by a small red *cask buoy*, and a breakwater, to be 600 ft. long, is being built from the point in the direction of the buoy. Vessels should not bring Ha sima to bear northward of N.E. by N.

Anchorage may be obtained in 6 to 8 fathoms in any part of the bay, but large vessels should not go inside the outer red buoy, as there the anchorage space is only 2 cables broad. Boats may pass through the canal to F'ka ura.

Tides.—It is high water in Yokoska Harbour, on full and change, at $5^h 15^m$; springs rise 8 ft., neaps 4 ft.

F'ka ura, an inlet 8 cables long, and 4 to 2 cables wide at the entrance, opening out to over 6 cables wide at its head, affords good anchorage in 7 to $4\frac{1}{2}$ fathoms, mud, the water shoaling gradually, but the head shoals rapidly at $1\frac{1}{2}$ cable from the shore. Shoals extend $1\frac{1}{2}$ cable off *Ako saki*, its eastern entrance point, and a reef lies $1\frac{1}{2}$ cable off the western point. *Yenokido* is a deep inlet on the western shore, a good harbour for junks, but with too narrow an entrance for ships.

Natsu sima is a partially wooded island, 184 ft. high, lying between F'ka ura and the entrance to *Kanasawa Inlet*. A shoal spit extends 7 cables East of it. *Yeboshi yama* is a conical rocky islet, joined to the shore at low water, 1 cable from the S.W. point of Natsu sima. Westward of Natsu sima a creek winds round in a northerly direction, and opens into a large shallow lagoon, in which a narrow channel, marked by stakes and bushes, leads up to the village of *Kanasawa*, in the N.E. corner. From this village there is a good road, through a remarkable narrow pass, to the town of *Kamakura*, formerly an opulent town, and famous for its ancient temples. About 2 or 3 miles from *Kamakura* is the celebrated colossal bronze statue of *Daibutsu sama*.

From Natsu sima the coast takes a northerly direction for 3 miles to *Graham Bluff*; it is shallow for some distance off, and at 2 miles off is skirted by detached mud banks of $3\frac{1}{2}$ and $4\frac{1}{2}$ to 5 fathoms. A patch of $1\frac{1}{2}$ fathom lies 1 mile N.E. by E. from *Graham Bluff*.

Mississippi Bay (*Nigisi*), between *Graham Bluff* and *Treaty Point*, 3 miles to the N.E., is well sheltered from the prevailing winds. In anchoring, give the shore a wide berth, to avoid a shoal extending half to three-quarters of a mile from it.

Treaty Point, or *Homuku*, the termination of a ridge of low hills extending into the Bay of Yedo, about $10\frac{1}{2}$ miles N.N.W. of *Kuwan-on saki*, forms the southern point of the Bay of Yokohama. It is formed of a long line of conspicuous yellow cliffs, 100 to 120 ft. high, the northern bluff of which is *Mandarin Bluff*, or the *Haycock*. These bluffs, and a bank which fronts them to the distance of $1\frac{1}{2}$ mile in some places, protects the anchorage off Yokohama from south-easterly winds, which send in a heavy sea. A red buoy, bearing a cage, is moored in $4\frac{1}{2}$ fathoms on the northern extreme of the shoal, southward of the anchorage, with *Mandarin Bluff* bearing S. by E., and the centre of *Kanagawa Fort*, N.W. $\frac{1}{2}$ N.

A LIGHTVESSEL, painted red, with two masts, and a red ball at the foremast head, is moored in 10 fathoms at the extremity of the shoal off *Treaty Point* and *Mandarin Bluff*, with *Treaty Point* bearing S.W. $\frac{3}{4}$ S.; *Mandarin Bluff*, S.W. by W.; and the mouth of the canal, just northward of the English naval stores, W. $\frac{1}{2}$ N. The vessel exhibits a fixed red light, elevated 36 ft., and visible 10 miles.

Fog Signal.—In foggy weather a *Bell* is sounded *five times* in quick succession at intervals not exceeding *five minutes*.

YOKOHAMA, the most important of the ports open to foreign commerce, is built on a plain surrounded by low hills, and is environed by a canal. Its inhabitants number about 120,000, with about 1,300 Europeans and Americans; the latter occupy the S.E. part of the town. Two hatobas, or stone piers, afford excellent landing, the northern, the English hatoba, affording complete shelter for boats, and immediately opposite it is the English Consulate, with three peculiar towers. The English Naval Hospital is on the bluff where the camp formerly was; the old hospital, at the southern end of the town, has been converted into naval victualling stores; the observation spot in the square is in lat. $35^{\circ} 26' 23''$ N., long. $139^{\circ} 39' 13''$ E., the latter determined telegraphically in 1881-2 by U.S. officers. Yokohama is connected by railway with Tokio (Yedo), the terminus being on the N.W. side of the town. There is regular steam communication with San Francisco, Shanghai, and Hong Kong, and also with the chief Japanese ports. From Tokio a railway runs to Takasaki, in the interior, and from thence it is proposed to construct a line to Lake Biwa, thus completing railway communication with Osaka and Hiogo.

A *fixed red light*, visible 6 miles, is shown from a white staff on the extremity of the English hatoba.

All supplies, provisions, water, coal, &c., can be procured in abundance, and ordinary repairs both to ships and engines are easily executed.

Yokohama exports tea, silk, lacquered goods, vegetable wax, oil, anders, cotton, and rice in small quantities. For the Chinese market, paper, camphor, flour, peas, beans, seaweed, isinglass, béche-de-mer, and dried shell-fish. The imports are chiefly cotton and woollen goods, metals, and kerosene. The greater part of the exports are sent to the United States. In 1883, 313 foreign vessels, with a total tonnage of 556,024, entered the port, of which 172, with a tonnage of 339,618, were British. The value of the imports in the same year amounted to £3,878,877, and the exports to £5,352,336.

Kanagawa.—At the head of the bay and on its North side stands the town of Kanagawa, one of the first ports opened to foreigners, but this being an inconvenient situation for a settlement it was changed to Yokohama on the South side, where the water is deeper for anchorage and more convenient for the landing of boats and merchandise; at Kanagawa it is so shallow that at low tide the sea retreats to a considerable distance from the shore. Kanagawa is subject to frequent shocks of earthquake. It is situated on the Tokaido or imperial highway to Tokio, and British subjects are free to go where they please within 21 miles of it, except towards Tokio, the boundary in that direction being the River Logo. All persons, excepting officers in uniform, passing by road between Yokohama and Tokio, must produce a passport at the river.*

* The limits of the Treaty Port Kanagawa to the North lies along the course of the Logo River, which, after pursuing an easterly direction, enters the sea midway between Yedo and Yokohama. At 25 miles above the mouth of this river the treaty boundary leaves the

A red *buoy*, bearing a cage, is moored in 4 fathoms on the point of the spit extending from Kanagawa Fort towards Yokohama anchorage; it lies S.E. $\frac{1}{2}$ E., 1 mile from the fort.

Anchorage.—A good anchorage for large vessels is in about 5 fathoms, mud, with Kuwan-on saki just open of Mandarin Bluff, the latter bearing S. by E., and the British Consulate S.W. by W. $\frac{1}{2}$ W. Vessels of lighter draught may anchor much nearer the town. Large vessels are recommended to moor.

Tides.—It is high water in Yokohama Bay, on full and change, at 6^h; springs rise 6 $\frac{1}{2}$ ft., neaps 4 $\frac{1}{2}$ ft.; with southerly winds the tide rises about 2 ft. higher. The streams are scarcely felt here, but they run strong in the middle of Yedo Bay, and their velocity is much increased off Saratoga Spit, Saru sima, and Kuwan-on saki, particularly off the latter.

Kawa saki, or *Haneda Point*, bearing N.E. $\frac{1}{2}$ N. from Treaty Point light-vessel, is low and wooded, and has a *beacon* on it; shoal water extends 1 $\frac{1}{2}$ mile from the shore, around and between it and Yokohama, the edge being marked by a lighthouse and a buoy. The latter is red, with a cage, moored in 6 fathoms, with Treaty Point bearing S.W. $\frac{1}{2}$ W.; Kawa saki, N. $\frac{1}{2}$ W.; and Bansu hana, E.S.E., southerly.

LIGHTHOUSE.—On the edge of the shoal off Haneda Point, in 7 ft. water, is a screw-pile lighthouse, 53 ft. high, painted in black and white bands. It shows a *fixed green* light, elevated 40 ft., and visible 8 miles between N.W. by N. $\frac{1}{2}$ N. and S.W. by W. $\frac{1}{2}$ W.

TOKIO, formerly known as **Yedo**,* the capital of the Japanese empire, is situated at the N.W. part of Yedo Bay, along the shore of which it extends, with its suburbs, for 8 miles. The population, in 1882, amounted to 974,084. Its aspect is not imposing from seaward, as large stacks of timber and elevated ground conceal by far the larger part of the city. Five batteries also interpose between the anchorage and the city. These, with several others on the shore, have green turfed parapets and escarps faced with stone, and are surrounded by a piling of timber which is covered at high water. The suburb of *Shinagawa* lies to the South of the city, where are seen the low wooded heights of Goten yama, extending 2 miles along the shore. The landing place is about 1 $\frac{1}{2}$ mile up the western mouth of the Sumida gawa, and near the railway station, close to which is Tsukiji the Foreign "Concession," and the Imperial Navy Department. The British Legation is 2 miles from the landing place, West of the Tycoon's Castle.

river and pursues a southerly direction to the coast, which it joins just eastward of Odiwara, in long. 139° 10' E. The southern boundary line runs from O-tsu-no ura on the East to Asina Bay on the West. The territory open to foreigners is thus about 25 miles square.

* On the restoration of the Mikado government, in 1868, the old name of Yedo was changed to Tokio, meaning the Eastern Capital, in distinction from Kioto, or the Western Capital.

The small river *Sumida gawa*, which flows through the centre of Tokio, splits into two streams, flowing southward for about 2 miles through the extensive mud-flats which nearly fill up the head of the bay fronting the city; boats and small junks can use these channels.

Light.—On the West side of the fort, at the entrance to the western or Tsukiji Channel, a *fixed red* light is shown, elevated 52 ft., and visible 9 miles between E.S.E. and N. by E. $\frac{1}{2}$ E.

The bay fronting the city is very shoal, a bank of less than 3 fathoms water on it extending from 2 to 3 miles from the shore, and in some parts even a ship's boat could not approach the shore within a mile at low water. The best anchorage for a large vessel is in 5 to 6 fathoms, soft mud, good holding ground, with the white lighthouse on the middle fort bearing N.W. $\frac{1}{2}$ N., distant $3\frac{1}{2}$ miles; smaller vessels may anchor nearer the fort on the same bearing, but at 2 miles from the fort the depths shoal suddenly from $3\frac{1}{2}$ to 2 fathoms.

The Coast from *Tone gawa Point* round the head of Yedo Bay is low, with shoal water extending a considerable distance off it, and forms a deep bay with 7 to 13 fathoms. *Bandzu hana*, about 8 miles S.E. from Kawa saki, is low, and from hence the low coast trends in a southerly and south-westerly direction for 12 miles, and is shoal from $1\frac{1}{2}$ to 2 miles off shore.

Futsu saki is a low sandy point, having a fort at its high-water line, 8 miles S.W. from Bandzu hana. From its extreme, sands, which dry at low water, stretch out in a narrow tongue $1\frac{1}{2}$ mile to the westward, forming the dangerous *Saratoga Spit*; and shoal water extends still farther westward, its outer extreme being 3 miles from the point. A red buoy, bearing a cage, is moored in 9 fathoms, West of this tongue. To clear this shoal, Kuwan-on saki lighthouse should not be brought to bear westward of S. $\frac{1}{2}$ E.

From Futsu saki the coast takes an easterly and southerly direction, forming a deep bay, the northern shore of which is sandy and low, but the southern is the termination of the slopes from the high range Noko-gheri yama, and is rocky and steep-to. Shoal water extends from $1\frac{1}{2}$ to 2 miles from the shore in the centre of the bay. Kanaya Point, and the coast to the southward is described on pages 831-2.

DIRECTIONS.—Approaching the Gulf of Yedo from the southward or westward, in clear weather, the chain of islands running southward from it are unmistakable landmarks, and Cape Idsu can scarcely be mistaken. Omai saki, the point 25 miles westward of the cape, is low, while the cape, as before stated, is high, bold, and rocky. From $1\frac{1}{2}$ mile eastward of Rock Island a N.E. $\frac{1}{2}$ E. course will lead 4 miles N.W. of Vries Island, from which position the centre of the entrance of Uraga Channel bears N.E. by E., distant 22 miles. Care must, however, be observed, when approaching Cape Sagami, not to be drawn into Odawara Bay by the indraught mentioned in page 829. Should Vries Island be visible, this danger is easily guarded against by not bringing that island southward of S.W. by S.

Vessels approaching the gulf from the eastward are recommended not to hug the shore of the South end of Awa too closely, to avoid the dangerous shoals eastward of No-sima Point. By night the light on No-sima will be an efficient guide, but care must be taken of the extremely dangerous Mela Ledge. To avoid this and all other known danger, when rounding from the eastward, do not bring the eastern extreme of land *seen* to bear eastward of E.N.E. until Tree Saddle Hill is seen open of the extreme of Su-no saki, bearing N. by W. $\frac{1}{4}$ W.; and, when rounding from the westward, do not shut in this hill with the extreme of Su-no saki until the eastern extreme of land bears E.N.E. At night, should the light not be seen in thick weather, soundings of 40 fathoms may be considered as indicating close proximity to these dangers.

In steering for Uraga Channel, Tree Saddle Hill on the South end of Sagami Peninsula will be readily recognised; and on nearing the channel the Ashika sima or Plymouth Rocks will be plainly seen on its western side. Give these rocks and the Ka yama or Elmstone Rock a berth of half a mile in passing, or at night keep without the *red* sectors of the lights, and after rounding Kanon saki at about the same distance steer N. by W. $\frac{1}{4}$ W., which will lead between Saratoga Spit and Saru sima. In thick weather, with a strong ebb tide running, be careful not to be set eastward of the Saratoga Spit buoy. Continue this course until Treaty Point lightvessel is seen, when steer to pass eastward of her, taking care not to bring the light to bear northward of N. $\frac{1}{4}$ W. The elevated ground about Mandarin Bluff, showing to seaward in brown cliffs, well wooded to the summit, will be readily recognised, the bluff being the most eastern.

The lightvessel may be passed within a cable, and then steer to pass northward of the red buoy, and anchor as convenient, the depths gradually decreasing as the anchorage is approached. Do not shoal to less than 7 fathoms when rounding Treaty Point and Mandarin Bluff, neither of which should be approached to a less distance than $1\frac{1}{2}$ mile.

A sailing ship will have to make short tacks when working into Yokohama Bay with a westerly wind, as North of Mandarin Bluff the deep-water channel is narrowed to $1\frac{1}{2}$ mile; the lead here, however, as round nearly the whole shores of Yedo Bay, gives fair warning.

If proceeding from Yokohama to Yedo anchorage, stand out E. by N. till the house in the tree clump (of which the roof only is generally seen) of Kawa saki bears N.N.E., when haul up N.E. or N.E. $\frac{1}{4}$ E. along the shore, which is skirted by a shallow reef nearly $1\frac{1}{2}$ mile broad, and very steep at the edge, passing well eastward of the buoy and lighthouse, and taking care not to decrease the soundings under 9 fathoms till the lighthouse bears West, distant 1 mile. Then haul up North, and anchor in 6 fathoms with the southern part of the wooded heights of Goten yama bearing West, and the lighthouse on the middle one of the five forts N.W. $\frac{3}{4}$ N., or steer in upon the latter bearing, and anchor in any convenient depth, as above.

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Working through Uraga Channel.—With a northerly wind a vessel, after passing Cape Sagami, may stand across and tack close to the opposite shore, as there are no rocks at any distance off it to the northward of Kanaya Point, and to the southward of the point the dangers show. If unable to fetch this point, it would not be prudent to stand into the bay between the point and Uki sima, a rocky islet 150 ft. high to the southward, as foul ground exists there. This bay will be readily recognised from a distance, as it is the sea-shore of a valley between the Miogani yama and Sveno yama ranges, and two small hills are in the centre of it.

In making the western board, the foul ground in Kaneda Bay, and off the coast thence to Kuwan-on saki, must be remembered. The shore of Kadsusa Bay, northward of the Miogani yama range, may be approached by the lead, tacking in 5 fathoms.

If unable to fetch Kuwan-on saki on the starboard tack, be careful to tack short of the bearing for clearing the Ka yama, page 834. Short tacks should be made when to windward of Kuwan-on saki, not shoaling towards the opposite or Kadsusa shore to less than 9 fathoms. When Saru sima bears W. by S., stand no farther eastward than to bring Kuwan-on saki to bear S. $\frac{1}{2}$ E., until Saru sima is S.W. $\frac{1}{2}$ W., when Saratoga Spit will have been weathered. At night do not bring the light off Treaty Point to bear West of N. by W. $\frac{1}{2}$ W., until Kuwan-on saki light bears S. $\frac{1}{2}$ E. Long boards may now be again made, but do not shoal on either tack to less than 5 fathoms, nor off Yokohama Bluff to less than 7 fathoms. There are some shoal patches of $3\frac{1}{2}$ to 5 fathoms, sand and mud, off the western side of the bay between Saru sima and Mississippi Bay, but none are known at a greater distance off than 2 miles, and they may be avoided by not bringing Saru sima to bear eastward of South.

The Tides are much affected by the winds, but both flood and ebb sweep with great velocity round Saratoga Spit. The flood runs N.W. by W., and the ebb S.W. by S., about $3\frac{1}{2}$ knots an hour at springs. Generally the flood stream sets a vessel on to the western shore.

VOLCANIC ISLETS, SOUTH-EAST OF JAPAN.

A very remarkable range of detached islets and rocks extends for about 300 miles in a S. by E. direction from Vries Island, at the entrance of the Gulf of Yedo. There is no portion of the ocean which has been more misrepresented than this in our older works, and the great number of supposed discoveries rendered the charts so confused that no adequate idea could be gained of their number or arrangement. The author endeavoured, in 1858, to reconcile these vague surmises and great discrepancies, so as to give a more correct representation of their real character.*

* See Transactions of the British Association, 1858.

This geographical confusion arose, no doubt, from the unsuspected influence of the great Japanese current, which rushes through the group with exaggerated and uncertain velocity, and thus affecting the dead reckoning of many or most of the ships which announced discoveries, most of which are to the eastward of the true positions. It will be unnecessary to discuss these varying accounts, since they are now in a great measure reconciled by exact observations; and this is of the greatest importance, seeing that the large commerce between China, Japan, and North-Western America, passes through these channels. What follows will, therefore, be confined to a brief description of what is well ascertained, connected with an identification, when possible, with what has been but vaguely surmised.

These islands are all bold-to, some appearing to rise like a wall from the depths of the ocean, and they have but few outlying hidden dangers. The lead, therefore, in foggy weather, will give little or no warning, as in some cases no soundings will be obtained with 150 fathoms of line within half a mile of the shore.

The Currents, also, in this part of the Japan Stream, are influenced by the prevailing winds; heavy current-rips, being of very common occurrence, have often been mistaken for shoals. These rips are more constantly met with close to the islands and rocks than otherwise. It may be well to bear in mind that in calms, although the stream may appear to be hurrying the vessel on to an island, if the island be steep it will always turn to the right or left on approaching within a certain distance of the rocks; not so, however, should shallow water extend any distance, when the anchor must be depended on.

The usual set of the current through these islands is north-easterly, and the rate ranges from $1\frac{1}{2}$ to 3 knots, but the islands frequently deflect it from its course, and the eddies always found on the margin of great currents are here particularly numerous and active. Close to Fatsizio and Vries Islands, at less than a third of a mile off, a regular change of tidal stream has been observed, and also between these islands and the coast.

As above stated, in their vicinity, in fact throughout the path of the Japan current from the South end of Formosa to Behring Strait, constant heavy tide-rips will be encountered, which, in light winds, frequently render a vessel for a time unmanageable. (See note on page 826).

OO SIMA, or Vries Island, is the northernmost of these islands. It is an active volcano, and Krusenstern applied the name of *Vries Island* to it, to distinguish it from that to the south-westward. On Von Siebold's chart it is called *Barneveld Island*. Its S.E. point is in lat. $34^{\circ} 40' N.$, long. $139^{\circ} 25\frac{1}{2}' E.$; its N.W. point is a bluff, 350 ft. high. The island is oval shaped, about 9 miles in extent N.W. by N. $\frac{1}{2}$ N. and S.E. by S. $\frac{1}{2}$ S., and 5 miles wide, and its summit, *Mihara*, attains an elevation of 2,550 ft. Mihara is an active volcano, over which a white vapour cloud is generally floating, and frequently, at night, it brightly reflects the glare of the subterranean fires in the crater be-

neath, forming in clear weather a conspicuous landmark, visible by night or day for many miles.

There are several villages on the island, and a population of about 5,000. The coast is free of all danger, with the exception of a few detached rocks and boulders lying close to it. The principal village is on the North side, off which a narrow bank affords a precarious anchorage in 12 to 18 fathoms. Another considerable village, having the advantage of a junk harbour, is situated at the S.E. point. Landing may be effected at the North village, or in the junk harbour. The inhabitants were civil and hospitable, but averse to strangers visiting the volcano. The *Broken Islands* of the old charts lie to the southward of Vries Island. They were examined by H.M.S. *Actaon*, in 1861, and consist of the following.

To sima, 10 miles S.S.W. of Vries Island, is 1 mile in diameter, pyramidal shaped, and its summit 1,730 ft. high.

Utoné, 2 miles S. $\frac{1}{2}$ E. from To sima, is a conical islet, 660 ft. high; detached rocks lie near its shores.

NII SIMA is about $2\frac{1}{2}$ miles S. $\frac{1}{2}$ W. from Utoné, and from its broken outline appears from a distance as several islands. Its extent is 5 miles, North and South, and its most elevated part 1,490 ft. above the sea. There is a small low islet a short distance off its S.E. point, and another off its western side.

Sikine sima, about $1\frac{1}{2}$ mile S.W. of Nii sima, is low, with a small islet off its North end. It is $1\frac{1}{2}$ mile long, N.N.E. and S.S.W., and one of the vessels of the American squadron passed between it and Kosu sima, and saw no danger; there is, therefore, reason to believe that the channel is safe.

KOSU SIMA, 5 miles S.W. of Sikine sima, and in lat. $34^{\circ} 12\frac{1}{2}'$ N., long. $139^{\circ} 9\frac{1}{2}'$ E. (centre), is elevated 2,000 ft. above the sea. It is $3\frac{1}{2}$ miles long, N.E. and S.W., and may be recognised by a remarkable snow-white cliff on its western side, and a white patch on its volcanic summit, to the northward of the cliff. There is a safe channel, 15 miles wide, between Kosu sima and Miaki.

Two small rocky islets lie close together about half a mile off the centre of the eastern shore of Kosu sima, and about 2 miles westward of the S.W. point are *Onghashi* or *Brood Rocks*, which should be given a safe berth, as their jagged appearance would lead to the belief that there are many hidden dangers in their immediate neighbourhood.

REDFIELD ROCKS, or *Sanbon-take*, thus named by Commodore Perry, U.S.N., in 1854, after the well-known meteorologist, lies 20 miles S.W. $\frac{1}{2}$ W. from Kosu sima. They are the most western of the chain of islands and rocks South of the Gulf of Yedo, and the most dangerous of the whole group. They consist of two patches of black rocks, extending nearly 3 miles N.N.E. and S.S.W. The southern rocks, in lat. $33^{\circ} 56'$ N., long. $138^{\circ} 48\frac{1}{2}'$ E., are about 20 ft. above high water, while the northern are only about half that height. Nearly midway between them is a *flat rock*, over which the sea breaks heavily,

and the heads of two or three small rocks crop up around it. There is said to be deep water between the flat rock and the northern patch, but except in a case of sudden emergency it would not be prudent to attempt passing through. The hand-lead will afford no warning when approaching this dangerous cluster, and in thick weather the islands in the vicinity would not be seen. The current in their vicinity set on one occasion about N. by E., and its rate was 2 to 3 knots.

MIAKI, Mitake, or Volcano Island.—The flat summit of this island, 2,690 feet high, is in lat. $34^{\circ} 5' N.$, long. $139^{\circ} 31\frac{1}{2}' E.$ It is called Brandten Eyland (burning island) by De Vries, who places a group of rocks about 2 miles to the S.W. of it. Broughton says that there are some black rocks 2 or 3 miles from its East point. It is about 5 miles in diameter, and according to Broughton well cultivated, and covered with verdure to the summit.

Onohara is a small group, 5 miles W.S.W. of Miki. It is composed of a cluster of seven or eight high detached rocky pinnacles, the centre one being perforated in two places. When bearing from E.N.E. to N.E., they appear as one islet.

Mikura, or Prince Island of De Vries, is also high, its summit being in lat. $33^{\circ} 52' N.$, long. $139^{\circ} 35' E.$ Von Siebold marks it as the *Ongelukig Eyland* of De Vries.

BROUGHTON ROCK, or Kanawa, in lat. $33^{\circ} 39' N.$, long. $139^{\circ} 17\frac{1}{2}' E.$, is a small inaccessible islet about 60 ft. high, flat topped, and so bold that at about a third of a mile from its N.E. side no soundings could be obtained with 180 fathoms line. The northerly current in its neighbourhood was found to be particularly strong, running nearly 4 knots an hour.

FATSIZIO ISLAND, or *Hachijo*, the most southern of the islands visited by the *Actæon*, is $8\frac{1}{2}$ miles long, N.W. by N. and S.E. by S., and 4 miles wide at its broadest part. In shape it is nearly oblong, rounded at the N.W. end, while at its S.E. end a slight curve forms a bay, the observation spot in which, close to some small huts, is in lat. $33^{\circ} 4' 24'' N.$, long. $139^{\circ} 50' 24'' E.$ Anchorage was obtained off this bay in 16 fathoms, sand and gravel, at less than a mile from the shore, but quite exposed from S.S.W. to N.N.E., and a vessel would always be liable to experience a heavy swell. There was 30 fathoms, dark sand, at about 2 miles off this shore, but the rest of the coast appeared to share the bold features and to be as steep-to as the generality of these islands.

This island is a penal settlement of Japan. Its highest part is the northern, where a mountain reaches an elevation of 2,840 ft. At the base of this mountain, and creeping up for some distance on its West side, is an extensive settlement, while in several places along both shores are found little hamlets and villages, so that the island would appear to support a considerable population. A tract of low land in the centre of, and extending across, the island is well cultivated. To the southward of this the land again assumes a considerable elevation, but does not reach the altitude of the northern part.

At the S.E. end of Fatsizio are two or three small streams of delicious water falling down the rocks, and in smooth water boats may readily obtain an abundant supply. It is high water, on full and change, at 6^h; springs rise 5 ft.

Kodzine is a small and nearly oval-shaped island, 1,820 ft. high, 1½ mile long, lying 2 miles westward of the highest part of Fatsizio. Some small rocks, as is also the case with Fatsizio, are found quite close inshore, but no off-lying dangers are at present known. A small population is to be found on the lower part of the island.

The islands southward of Fatsizio were visited by the U.S.S. *Alert*, 1880, and some of the following information is taken from Commander Huntington's report.

AOGA, Onango sima, or *South Island*, is a Dutch discovery verified by Colnett, and according to Commander Huntington is in lat. 32° 28½' N., long. 139° 43½' E. It is about 1,000 ft. high, of irregular volcanic formation, 3 miles long by 1 mile wide. Its coasts are steep, and the only landing place is on the N.E. side, near a sharp rock, 8 ft. above high water, lying at a little distance from the land. The landing place can easily be distinguished by some huts in the vicinity, but landing can only be effected in the native boats, on account of the constant heavy surf. The island contains about 200 or 300 inhabitants, the descendants of Japanese criminals. The North and N.W. sides of the island are cultivated with barley, peas, beans, sweet potatoes, and radish, upon which, with fish, these poor people subsist; they have also a few cattle, and grow a little tea. There is very little timber. There are no springs, their water being supplied by frequent rains, and that is scarcely fit to drink. The people are much in want of food, clothes, fishing tackle, &c.

BAYONNAISE ROCKS, in lat. 31° 55' 15" N., long. 139° 54' 18" E., were seen by Capt. J. de la Gravière, in the French corvette *La Bayonnaise*, May 31, 1850, and his description accords with that of Koning Willem III. Island, by Capt. Houckgeest, mentioned below. They are a group of sharp-pointed rocks, elliptical in form, 2 cables long, North and South, with several hummocks, the northern and highest summit being about 30 ft. above the sea; several rocks extend a quarter of a mile off the N.W. and N.E. sides. Soundings were obtained by the *Alert*, within a quarter of a mile of these rocks.

Bayonnaise Rocks are probably the same as *Koning Willem III. Island*, seen, if not discovered, by Capt. Houckgeest, in the Netherlands brig *Koerier*, August 24, 1849, and placed by him in lat. 31° 52' 48", long. 139° 58' 46". They were also seen from the *Elizabeth Kimball*, in May, 1863, and her commander states that at 7 miles W.S.W. of the rocks the bottom was plainly visible in about 5 fathoms. Numerous other reports of rocks and reefs have been made in this locality, as described in the previous edition of this work, which may refer to this group, or have been owing to volcanic agency.

SMITH ISLAND, the next to the southward, was reported by Capt. Smith, of the *Heber*. It was first seen in March, 1846, during a gale of wind; and

on the return voyage, in December, 1846, a boat was sent alongside during a calm. He placed it in lat. $31^{\circ} 12'$, long. $139^{\circ} 55'$, and stated it to be of a needle shape, and probably 300 ft. high, but not more than 250 ft. in diameter at the base, surrounded by smaller penks beneath the surface. Capt. Stickney, of the barque *Sarah Warren*, states that at a short distance East of it was a rock, on which the sea broke furiously.

H.M.S. *Tribune* passed it January 18, 1859, the position being given as lat. $31^{\circ} 18' N.$, long. $139^{\circ} 50' E.$ It was described as a high pinnacle-looking rock, about three-quarters of a mile in circumference, with heavy breakers extending apparently a quarter of a mile from it, and a small rock close-to on the North side. Observations made on the *Alert* place it in lat. $31^{\circ} 27' 8''$, long. $140^{\circ} 2'$; its height was estimated at about 421 ft., and no bottom was found around it.

Capt. Scott, of the ship *Lucile*, states that on September 26, 1879, being in lat. $31^{\circ} 33'$, long. $139^{\circ} 38'$, he observed an island bearing S.E. by E. $\frac{1}{4}$ E., true, distant 15 or 20 miles, resembling in the distance three hummocks, the highest to the North. This accords with the position of Smith Island, but the appearance is entirely different.

Jeannette Island, stated to lie in lat. $31^{\circ} 30'$, long. $140^{\circ} 0'$, is probably the same. *Todos los Santos* and *San Tomas*, of the old charts, may refer to this or Ponafidin Island.

Volcano Island, reported to be 40 ft. high, is said to lie in lat. $31^{\circ} 21'$, long. $139^{\circ} 53'$, but its existence is doubtful. This position is not far from that in which Capt. Smith, of the *Heber*, and the officers of H.M.S. *Tribune*, placed Smith Island, as described above.

San Francisco Island.—The German war-vessel *Hertha*, in 1875 and 1876, passed an island described as small and steep, with a rock about 2 cables from its S.E. side. The position assigned to this island is lat. $31^{\circ} 29' N.$, long. $140^{\circ} 14' E.$, but it was not seen by the *Alert*.

There is still some amount of uncertainty about the last three islands; it is possible that active volcanic agency may account for this. In 1870 a volcanic disturbance was observed at 4 miles N.E. by N. of Smith Island.

PONAFIDIN, or St. Peter Island, was discovered in 1820 by the Russian lieutenant of that name, who gave it the name of *Three Hills Island*, from its having apparently three hummocks. According to Commander Huntington, of the *Alert*, it is of volcanic formation, about $1\frac{1}{2}$ mile long, East and West, and rises to a height of 1,176 ft., in lat. $30^{\circ} 28' 26'' N.$, long. $140^{\circ} 14' 12'' E.$ It is uninhabited, and its shores appear rugged and inaccessible. On its N.E. side is a small cove, named *Junk Cove*, where the party landed through the surf. This cove is only open to winds between North and East, and junks might find it safe to anchor here, but a large vessel would hardly find room to swing. The depth gradually decreases from 10 fathoms at the entrance. There is no timber or water. Gulls were very numerous.

A steamer caught in a gale in the vicinity of Ponafidin or Aoga sima, could obtain shelter by keeping close under their lee.

LOT'S WIFE, *Rica de Oro*, or *Black Rock*, according to observations on the *Alert*, is in lat. $29^{\circ} 46' 28''$ N., long. $140^{\circ} 19\frac{1}{2}'$ E. It is a tall pinnacle, rising about 466 ft. above the sea, and bearing a remarkable resemblance to a ship under all sail. No bottom at 20 fathoms was found within 30 ft. of it, but a rock lies off the western extreme. The current was setting to the S.E., causing a tide-rip.

This very extraordinary rock is thus supposed to be correctly placed on the chart, but it has been the subject of much doubt and uncertainty. In 1821, Lieutenant Povalichin, of the Russian Navy, discovered a rock of the form of a truncated cone, in lat. $30^{\circ} 31'$. In 1853, Capt. Somerby, of the barque *Isabelita Hyne*, discovered a black rock in lat. $29^{\circ} 42'$, long. $140^{\circ} 15'$, about 200 ft. high, and 100 ft. in diameter, with quite perpendicular sides. He called it *Black Rock*. It was seen by the *Linda*, in 1851, by which it is placed in lat. $29^{\circ} 42'$, long. $140^{\circ} 31'$, and was thought to be like a ship. It was also seen by the *Macedonia* and *Vincennes*, of the U.S. Surveying Expedition, and was placed in lat. $29^{\circ} 47'$, long. $140^{\circ} 22' 30''$. Its altitude was calculated to be 299 ft., and its base 40 feet.

Captain John Meares, well known in the history of early discoveries in the North Pacific, passed this, or a similar rock, when in command of the *Felice*, April 9th, 1788. Like most others who first saw it, he took it for a first-rate man-of-war, under a crowd of sail. "It obtained the name of *Lot's Wife*, and is one of the most wonderful objects, taken in all its circumstances, which I ever beheld. The waves broke against its rugged front with a fury proportioned to the immense distance they had to roll before they were interrupted by it. It rose almost perpendicular to the height of nearly 350 ft. A small black rock appeared just above the water at about 40 or 50 yards from its western edge. There was a cavern on its S.E. side, into which the waters rolled with an awful and tremendous noise."—*Meares*, p. 97.

Its position, as stated by Meares, was erroneous, in consequence of no allowance being made for the strong easterly drift, unsuspected by him. It is also the same as the *Haystack* of Krusenstern, and the *Rica de Oro* of the old charts.

The continuation of this line of volcanic eruptive rocks, through the Volcano and Bonin Islands, &c., will be described hereafter.

THE EAST COAST OF NIPON.

From Nosima saki (p. 831) the coast trends 3 miles eastward to Siamatsu, thence N.E. to Cape Erratatsi (Cape King), and thence N.E. by E., about 30 miles, to Iwa-wada, whence it trends North, 8 miles, to Ohigasi saki (Cape Blanco). The shore is wild and rock-bound; between Mela Head and Cape

King there are no cliffs, but between Capes King and Blanco the projecting points are generally rugged cliffs of yellow clay or gravel; the high land terminating near Ohigasi saki in a long-backed hill with two thumb-shaped pinnacles, fronted by a bold chalky cliff.

This coast is frequently obscured by fog, and is difficult to identify from the eastward, and vessels approaching from that direction are liable to be set out of their reckoning by the Japan Stream. The temperature of the sea often affords a useful guide, and the soundings give timely warning. In the summer months there are generally heavy breakers along this coast. Mela Head often shows out in relief, when all the coast eastward is obscured by fog.

A vessel entering Yedo Gulf from the eastward will nearly always experience a current against her off Mela Ledge, of 2 to 4 knots in summer. From No sima to Iwa-wada the current is weak inshore, and vessels making for the gulf should keep as near the coast as safety will permit, that is $1\frac{1}{2}$ mile off.

CAPE ERRATATSI or **King** has over it a wooded peak, *Takaska yama*, 759 ft. high, a useful landmark, it being the highest summit of the Mela promontory. Rocks extend 5 cables N.E. by N. from the cape. North of the cape temporary anchorage may be had in 8 fathoms, sand, sheltered from westerly winds. To the S.E. of the small village in the centre the depths are irregular and shallow. At the North end of the bay is a cultivated wooded hill, about 4 miles from which is a low point with a village on it. A rock, awash at low water, lies $5\frac{1}{2}$ cables off this point, Kitsu Point bearing N.E. $\frac{1}{2}$ E., distant $1\frac{1}{2}$ mile.

Kitsu ura.—*Kitsu Point*, the West extreme of Kitsu ura, is a broken rocky point, with two rocks close off it. The bay is very deep, and is the only point on this coast not protected by a bank of soundings. A large village is situated on the eastern shore. A peak, 1,341 ft. high, situated N.E. of Kitsu ura, is the highest land between Cape King and Inu-bo-ye saki. A rock, 5 ft. high, lies 1 mile N.E. $\frac{3}{4}$ N. from Kitsu Point; and 100 yards E.S.E. from the rock are several rocky heads.

Ko minato Point, 5 miles E.N.E. of Kitsu Point, is the West extreme of a line of cliffs, and has off it some detached pillar-shaped rocks. From hence the coast continues cliffy as far as Ohigasi saki, and skirted by reefs, through which are channels to numerous sheltered anchorages for junks. At *Naming-awa*, 2 miles E. by N. from Ko minato Point, the fishermen exhibit occasionally a fixed bright light.

KATSU URA, about $1\frac{1}{2}$ mile eastward of Naming-awa, is the only harbour between Mela Head and Sendai Bay affording temporary protection, for steamers only, from easterly winds; the holding ground is not good, and the anchorage is limited, a rocky 2-fathoms shoal lying near the centre. There are several fishing villages here, where fish, fowls, and water may be procured.

Hachimann saki, a narrow cliffy promontory, forms the eastern side of the harbour, and irregular depths extend nearly 1 mile South of the point, and

some rocks lie 2 cables N.N.W. of it. To enter, steer in for the centre of the sandy beach at its head, bearing N. by E. $\frac{1}{2}$ E., until the highest part of the reef N.N.W. of Hachimann saki bears S.W. $\frac{1}{2}$ W., distant about $2\frac{1}{2}$ cables, when anchor in 7 fathoms, sand. It is high water, on full and change, at about $5^h 10^m$; springs rise $5\frac{1}{2}$ ft., neaps 4 ft.

Rocks and foul ground extend 8 cables off shore, 1 mile East of Hachimann saki. *Iwa-wada Point* lies 4 miles N.E. $\frac{1}{2}$ E. from Hachimann saki, and when making for Katsu ura from the eastward, care must be taken not to mistake it for the latter point. Tide-rips and overfalls are frequent off Iwa-wada. From hence the coast trends N. by E., 4 miles, to *Ko-hama*, consisting of bold, steep, stratified cliffs.

Ohigasi or Daito saki, a bold wooded headland, 7 miles North of Iwa-wada, is the northern termination of the cliffy coast, which is here of a whitish colour, with several rocky pinnacles about 1 cable off. There is good holding ground, with westerly winds, in 4 to 7 fathoms, mud and sand, with the northern cliff bearing southward of West. From Ohigasi saki the coast trends 33 miles north-eastward, forming an open sandy bay as far as the cliffs of Inu-bo-ye saki.

INU-BO-YE SAKI, a projecting rocky headland with a smooth bare summit, 242 ft. high, stands out in bold relief. Its South shore is a black cliff, about 140 ft. high; the S.E. point is low, and foul ground extends 4 cables from it. Thence the shore trends northward, 3 miles, to a pillar-shaped rock, and thence N.W. to the mouth of the Tone gawa, rocky ledges extending 3 to 4 cables off it. There is temporary anchorage in 4 fathoms, sand, 2 miles West of the S.E. point.

LIGHTHOUSE.—On the S.E. extreme of Inu-bo-ye saki is a white tower, 103 ft. high, showing a *revolving bright* light, attaining its greatest brilliancy every half minute, elevated 168 ft., and visible 19 miles seaward between N. $\frac{1}{2}$ W. and W.S.W. Lat. $35^{\circ} 43' 30''$ N., long. $140^{\circ} 51' 32''$ E.

The Japanese steam-vessel *Meji Maru*, in swinging to her anchor off Inu-bo-ye saki, recently struck on a 15-ft. pinnacle rock. The vessel is said to have frequently anchored on the same bearings, and the master was of opinion that the rock had been thrown up during a recent earthquake. The vessel was anchored in $6\frac{1}{2}$ fathoms, at $1\frac{1}{2}$ mile from the beach, with the lighthouse bearing N.E. by N. $\frac{1}{2}$ N.; West end of small island, N.W. by N.; East end of reef, E. by N.; Black Rocks, N. $\frac{1}{2}$ E.—*U.S. Hydrographic Notice*, 1880.

The **Tone gawa** is the outfall of a series of streams and lakes, the waters of which take their rise not far from Tokio. Only the smallest craft can cross the bar at high water and in fine weather. There is a pilot-office at *Chōsōi*, on the South bank, and here there is a population of about 25,000, chiefly fishermen. There is daily postal communication with Tokio by means of steam launches. Firewood and charcoal are plentiful.

North Pacific.

There is anchorage, during westerly winds, in 6 fathoms, sand, at 7 cables northward of the entrance, but it cannot be recommended.

The Coast from Tone gawa to *Machama*, 35 miles northward, is wooded, and from hence to *Kawajiri*, a fishing village 18 miles farther northward, the shore is bounded by low cliffs. North of *Kawajiri* the hill ranges commence. There are no known anchorages between *Kawajiri* and *Sendai Bay*, a distance of about 110 miles. *Toyoma Point*, about 80 miles northward of the Tone gawa, is said to have a dangerous reef extending $2\frac{1}{2}$ miles E.S.E. of it.*

SENDAI BAY, in lat. $38^{\circ} 20' N.$, lies between *Matsu sima* on the West and *Amitsu-hama Island* on the East, about 20 miles apart. The land surrounding it is mountainous, and in places thickly wooded. The sharp wooded summit of *Kingkasun Island* is conspicuous. Large fishing "look-outs" are often found moored in the bay. Care is necessary in approaching the group of wooded islands and rocks off *Matsu sima Bay*, in the N.W. corner of *Sendai Bay*, as reefs and rocks extend off them to a considerable distance. There is said to be an indraught into the bay. At 10 miles inland there is a high, easily-recognisable mountain, about 4,600 ft. high, in about lat. $39^{\circ} 28' N.$, long. $141^{\circ} 41' E.$; unfortunately it is frequently obscured by clouds.

Matsu sima Bay is extensive but shallow. In its southern entrance, which is obstructed by low reefs and sunken rocks, is the village of *Sabusawa* and the small port of *Ishibama*, where small steam-vessels call. The northern entrance to the bay, 4 miles to the northward, is completely blocked up by a sand-bank, but good shelter for two or three vessels may be obtained off it in 5 or 6 fathoms, mud, open only to the East. When making for this bight a remarkable pinnacle rock, about 60 ft. high, with trees on its summit, stands off the coast, and there is a reef of rocks just northward of it. Anchorage may be obtained with north-westerly winds, northward of this pinnacle rock, in about 6 fathoms.

Kita Kami River, the largest of two rivers in the northern part of *Sendai Bay*, is said to be navigable for junks for 70 miles, and boats can reach *Morioka*, 120 miles distant. A fixed bright lantern light, elevated 52 ft., and visible 6 miles, is shown from a white staff on the East side of the entrance; but it can with difficulty be distinguished from the lights of the village, *Ishinomaki*, and the junks.

At $3\frac{1}{2}$ miles eastward of the entrance is the fishing village of *Watanoka*, situated on the western entrance to an extensive basin.

Amitsu-hama Island is rocky, and rises in bare hills; it has deep water on

* *Arkold Rock*, reported by the Russian frigate *Arkold*, in 1859, to lie in lat. $36^{\circ} 15' N.$, long. $141^{\circ} 28' E.$, was again reported in thick weather, by the Russian war-vessel *Sibole*, in 1870, about 11 miles southward of the spot in which it was first reported; it was said to be 20 ft. high. This danger has been searched for, and its position passed, by several of H.M. ships, but no signs of it were seen. It has been removed from the charts.

its N.E. side, but a reef extends some distance off its S.E. point. Depths of 16 to 19 fathoms will be found between the island and Nagasama, and anchorage for large vessels may be obtained in 12 to 9 fathoms, sand, off its North end. *Aikawa*, the second bay on the mainland, abreast the North end of Nagasama Island, is half a mile wide, affording anchorage in 7 to 9 fathoms, mud. This bay may be recognised by its having the only white sandy beach in the vicinity, and from a wooded islet lying off its northern point. This is a safe anchorage, and the first sheltered spot for vessels bound northward from Yedo Gulf. It is easy of access, the entrance being between the cape West of Kingkasan and the S.E. point of Amitsu-hama, off both of which there are reefs. The reef projecting 3 cables from the southern cape is dangerous, as the sea breaks on it only when there is a heavy swell.

Both these anchorages afford shelter from North and East winds, but a heavy sea is thrown in by winds from East to N.W.

Nagasama and *Tasiro*, two islets north-westward of Amitsu-hama, lie N.W. and S.E. of each other, and are about 150 ft. high, *Tasiro* being the southern, and connected with Amitsu-hama by a reef. Off the S.E. end of *Tasiro* is a small islet, and a single rock, which dries, lies 2 cables East of the southern extreme of *Nagasama*.

KINGKASAN, or *Goldmine Island*, is bold, rising in a wooded peak, 1,000 feet high. It may be passed close-to, but the depth between it and the shore is only 3 fathoms; there is anchorage on the South side of the narrows. The island is resorted to by pilgrims, it being dedicated to religious purposes. Deer are numerous, and are considered sacred. Mica is found in large quantities.

LIGHTHOUSE.—On its East side is a granite tower, 40 ft. high, showing a *fixed bright* light, elevated 178 ft., and visible 19 miles seaward between N. by E. and S.W. $\frac{1}{4}$ W.

Fog Signal.—In foggy weather a steam *Siren* will sound a blast of 5 seconds in every minute.

The Coast between Kingkasan and Yamada, a distance of 70 miles, is at present but little known. It presents a deeply-indented outline, probably concealing some fine harbours, those of *Kama-i-shi* and *Odzutsu* being the only ones known. The shores appear high and bold, and are apparently thinly populated, fishing-boats being seen only off *Simidzu*. It is not recommended to pass inside *Hira sima*, *Asi sima*, and their contiguous groups, lying northward of Kingkasan.

KAMA-I-SHI HARBOUR, in lat. $39^{\circ} 16\frac{1}{2}'$ N., is a spacious inlet, a little over 1 mile wide at its entrance, and extends 2 miles westward, affording a secure sheltered anchorage. Its shores are broken and rocky, forming several bays, that in the N.W. corner being the largest; at its head is a sandy beach, at the North extreme of which is the town of *Kama-i-shi*, where fish, fruit, fowls, and water can be obtained. *Kama-i-shi* is more easy of access to a

sailing vessel than Yamada Harbour, 10 miles to the northward. It is not an open port, and at present there is no traffic whatever. At about 10 miles inland is a district abounding in iron ore of good quality, which will probably soon be worked by the Government. A railway is in course of construction, as also a pier in connection therewith.

Mataga saki, the northern entrance point, is faced with cliffs, and rocks extend 3 cables off it. There are two rocks near the centre of the harbour, about one-third of a cable apart; the northern has a depth of 6 ft. at low water, and the southern 2 ft. A *black buoy* is moored on the North side of the North rock; the southern rock is marked by a *red beacon*, an iron post, surmounted by a cage over a triangle. Vessels must not pass eastward of the beacon.

When entering, pass midway between *Mataga saki* and the southern shore, until the town opens out and the red beacon bears N.W. by W., when haul up for it, and steer for the town, passing about 1 cable South of the beacon.

Sangan sima, about 3 miles N.E. of the entrance to Kama-i-shi Harbour, is about half a mile long, with a wooded summit, and lies about three-quarters of a mile off the coast. On its S.W. part are some white quartz boulders, and also on the cape N.W. of the island.

ODZUTSU HARBOUR, in about lat. $39^{\circ} 23' N.$, long. $141^{\circ} 55' E.$, is three-quarters of a mile wide at its entrance, opening within to a spacious double bay, nearly 3 miles in depth W.S.W. and E.N.E. In the northern bay is the village of *Odzutsu*, on the North shore, and on the sandy beach at its head that of *Kirikiri*. Reefs extend half a mile more north-eastward of the southern entrance point, and on the southern side a peninsula is a large island. At nearly 6 cables West of the northern entrance point is a small islet, on which is a ruined temple; from it a reef extends 3 cables towards the North shore, nearly joining it, and protecting the anchorage off *Odzutsu* from any heavy sea. Fish is plentiful.

The harbour is surrounded by high, thickly wooded hills, about 1,200 ft. in height, and is open only to winds from E.N.E., from which, however, the anchorage off *Odzutsu* is perfectly sheltered. The depth varies from 27 fathoms at the entrance to 11 fathoms at the anchorage, $4\frac{1}{2}$ cables S.W. of *Odzutsu* mole; the holding ground, black mud, is good.

YAMADA HARBOUR, a large basin, surrounded by mountains upwards of 1,000 ft. in height, is entered by a deep broad pass, running S.W. between high bold shores. It is a magnificent harbour, perfectly landlocked, with good holding ground, and may be run for by a steam-vessel requiring shelter at almost any time with perfect confidence, but the water is too deep for anchorage except off *Yamada*. On the North shore is the village of *Osawa*, South of which, on a sandy beach at the head of the bay, is the town of *Shimo Yamada*. Supplies of any sort are scarce here, and the water is bad. *Oo sima* and *Ko sima* lie at the head, off the mouth of the *Ori-kasa kawa*; they are surrounded by a shoal flat.

Approaching from seaward, the many islets South of Yamada render it difficult to at once make out the entrance, but either from northward or southward a safe course will be to steer for the eastern extreme of the land seen, which will lead up to the harbour, when a mid-channel course may be steered for the anchorage in 6 fathoms, off the centre of the town of Yamada. In spring, fierce gusts of wind come down off the mountains, and it is advisable to have two anchors down. It is high water, on full and change, at 6^h 30^m; springs rise 4 feet.

Miyako Bay, 8 miles North of Yamada, is about 5 miles deep, with depths varying from 40 fathoms at the entrance to 5 fathoms at 1 mile from the sandy beach at its head. An island lies 3 cables off the shore on the West side of the entrance, 1 mile South of which is a peninsula projecting from the western shore, and protecting the anchorage off Miyako, South of it.

North of Miyako the coast takes a N.N.E. direction, bordered by broken cliffs, and backed by high flat ranges, which rise to about 2,000 ft., gradually decreasing in elevation towards the North until about *Sanemura Point*, where it becomes low. *Kuro saki* stands well out, and may be recognised by its small range of hills about 700 ft. high. Two isolated mountains can be seen behind *Hon-na-mi*. The land is densely wooded.

Cape de Vries is low and flat, about 330 ft. high, and is remarkable from the way it stands out between two bays. The *Dupleix* sailed along this coast from Cape Kiori to Cape Vries, at a distance of from 2 to 4 miles, and saw no danger except close to the shore.

SIRIYA SAKI, or *Cape Nambu*, the N.E. extremity of Nipon Island, is a narrow point, trending in a N.N.E. direction; the land for about a mile South of the extreme point is low and flat; it then gradually rises to a prominent hill with a double summit, called *Siriya yama* (Whaleback), the highest part, 1,321 ft., being about 2½ miles S.S.W. of the point. The coast for about 4 miles South of the point is rocky, South of which a sandy beach extends for many miles. From the N.E., at the distance of 6 or 8 miles, the outline of this point resembles the back of a sperm whale, with its head to the southward, the *Dodo Rocks*, off the point, forming the flukes.

LIGHTHOUSE.—On *Siriya saki* is a white tower, 94 ft. high, showing a fixed bright light, elevated 150 ft., and visible 18 miles seaward between S.W. by W. and S. ½ W. Lat. 41° 26' 10" N., long. 141° 29' 25" E.

Fog Signal.—In foggy weather a steam *Siren* will give a blast of 6 seconds at intervals of 1 minute. Should the *Siren* be out of order, a *Bell* will sound continuously 15 strokes per minute.

At 3 cables N.N.E. of the point is a conspicuous rock, 60 ft. high; there is no passage between. *Rattler Rock*, awash at low water, lies 8½ cables E.N.E. of the lighthouse. In 1879 H.M.S. *Charybdis* reported a rock 2 miles E. by N. of the lighthouse, but a thorough examination by H.M.S. *Flying Fish* failed

to find it. A narrow ledge of less than 20 fathoms, usually covered with tide-rips and overfalls, extends about 3 miles N.N.E. of Siriya saki.

The coast, from Siriya saki, trends S.W., and for about $3\frac{1}{2}$ miles to *Uiya mura* is foul and rocky. At $1\frac{1}{2}$ mile from the point is *Observatory Island*, a rocky islet, 1 cable from the shore, and 80 ft. high.

Temporary anchorage may be obtained on either side of Siriya saki; but, under any circumstances, it is a most exposed place, and great caution should be used. On the western side good shelter may be found from all winds, except those from West, through North, to N.E., off *Uiya mura*, in 7 or 8 fathoms, sand. On the eastern side, at 2 miles South of the point, vessels can anchor off the sandy beach. The lead is a safe guide, and from a vessel at anchor in 7 to 9 fathoms the light at Siriya saki is visible. A small vessel might anchor in 4 or 5 fathoms with good shelter.

Directions.—Vessels bound from the Gulf of Yedo to Tsugar Strait will, after passing Mela Head, experience the full force of the Japan Stream setting to the E.N.E. Having passed Mela Ledge and the shoals E.S.E. of Nosima Point, steer along the coast at a distance of $1\frac{1}{2}$ or 2 miles as far as Iwa-wada, and thence N.E. $\frac{1}{2}$ E. for Inu-bo-ye saki, passing the point at $1\frac{1}{2}$ or 2 miles distant. By keeping farther off shore, however, the Japan Stream will be more felt, and a more rapid passage ensured. After passing Inu-bo-ye saki, shape a course to pass at not less than 3 miles from the coast; North of this cape the Kuro Siwo is scarcely perceptible. This coast is known to be subject in spring to strong gales and much heavy weather.

During thick weather the bank of soundings N.E. of Iwa-wada forms a useful guide to vessels approaching from the eastward and bound southward; when, during summer, keep as near the coast as safety will permit, to avoid the strength of the Kuro Siwo.

Current.—The Oya Siwo flows to the southward along the N.E. coast as far South as Inu-bo-ye saki, its average width being from 100 to 200 miles. On nearing the entrance of Tsugar Strait a sudden fall may be experienced in the temperature of the sea of from 15° to 20° , as the vessel passes from the Kuro Siwo into this cold current.

THE STRAIT OF TSUGAR.

The **STRAIT of TSUGAR**, *Tsuguru*, or *Sangar*, separating Nipon from Yezo Island, is about 40 miles in length, E.N.E. and W.S.W., and $9\frac{1}{2}$ miles wide at its narrowest part. The following description is principally from the remarks of John Richards, Master Commanding H.M.S. *Saracen*, who surveyed the strait in 1855, and of Lieut. Hoskyn, H.M.S. *Sylvia*, 1882.

Winds.—Strong N.W. winds prevail in this strait during the winter, accompanied by snow and rain, and the weather is very boisterous. In April the wind hauls to the westward, with heavy squalls from the S.W. In May the

wind is from the southward, variable between S.W. and S.E. (sometimes more easterly or westerly), and fine weather commences, lasting until the middle of September, when it becomes unsettled, and summer commences to break up with frequent gales; winter fairly setting in in October. Dense fogs prevailed in May and June; after that period they are comparatively rare.

Current.—Through the middle of Tsugar Strait the current sets constantly to the north-eastward, but its breadth and velocity vary considerably according to the wind and weather. Before and during a N.E. wind H.M.S. *Saracen* found its strength was much diminished; but with the wind from the opposite direction, it would expand and fill up two-thirds of the channel against the strength of the western tide. Steamers bound westward from Hakodate should keep well inshore along the Yezo coast, to avoid the current as much as possible.

Tides.—The shores are subject to tidal influence, the flood making to the eastward. The tide in the stream ran about 12 hours each way near the full and change of the moon, and there were only two regular tides by the shore in 24 hours. On full and change, the flood stream made at Tatsupi saki at 6^h 30^m a.m., at 7^h at Cape Tsiuka, and at 7^h 30^m at Toriwi saki. The western stream began about 12 hours later. The turn of the stream takes place 1½ hour later every day nearly.

C. Pemberton Hodgson, Esq., H.M. Consul at Hakodate, writes:—"The tides set with terrific force from the Pacific and Japan Sea; coming from the S.E. and E.S.E. on the one side, and from the West, S.W., and N.W. on the other, they meet in the very middle of the strait. From any high land an observer may see such fearful concussions of the two tides, each running from 3 to 5 miles an hour, and such heavy breaking overfalls, that he may wonder how a ship can, even with a fair wind, face them; and, with comparative alarm, how, with a contrary wind, a vessel can beat against them."

CAPE YOKOISO or *Gamaley* is near the N.W. point of Nipon, and in approaching the western entrance of Tsugar Strait from the S.W., Bittern Rocks, described hereafter, will be seen lying W. by S., about 16 miles from it. The land about this cape is moderately elevated and level. The coast between it and Oho saki, to the northward, is low and sandy. Between *Sasagota Bay*, a large shallow lagoon, and Oho saki, 6 miles to the northward, the coast is safe of approach, having regular soundings, and fair anchorage in N.E. winds.

Oho saki, or *Cape Greig*, is remarkable from its peculiar form, and being the commencement of the high land extending to Tatsupi saki, 8½ miles to N.E. by N. ¼ N. The bay between these points, although containing much foul ground, may be useful to a vessel during an easterly gale.

TATSUPI SAKI, or *Cape Tsugar*, the South point of the western entrance to Tsugar Strait, is a bluff, 362 ft. high, from whence the land rises to the height of 2,200 ft., 4 miles inland. A large rock, 300 ft. high, lies 2 cables

N.E. of the cape, and is connected to it by a low neck of sand and stones. The cape is steep-to, but the strong eddies near it make it prudent not to approach it nearer than a mile.

Taka no saki, or *Gun Cliff*, $9\frac{1}{2}$ miles E. by S. $\frac{1}{2}$ S. from *Tatsupi saki*, is steep-to, and has a battery of six guns on its apex, which is 200 ft. high. In the bay between these points, off the town of *Memoyah*, about half a mile from the shore, there is capital anchorage in 8 fathoms, the best in the strait next to *Hakodate*. Wood and water is abundant here.

From the South point of *Nambu Peninsula* a steep cliffy shore trends 25 miles northward, nearly in a straight line to *Toriwi saki*. The cliffs are coloured with the most brilliant and varied tints, and, like the entire coasts of the strait, are of basaltic formation. Among the most remarkable are the *Red Cliffs*, 1,600 ft. high, 17 miles southward of *Toriwi saki*. At 9 miles farther northward are two remarkable pointed cliffs, named *Cape Yakosi* or *Double Head*. Nearly 2 miles S.W. of this head is a rock 42 ft. high; and North about 3 cables from this is a rock, awash at low water.

TORIWI SAKI, the northern point of *Nipon*, is a low tapering point, half a mile off which is *Omasaki sima* or *Low Islet*, 45 ft. high. The ground all around this cape and islet is very foul. The soundings off it are irregular, and the East-going stream causes swirls, tide-rips, and overfalls, sometimes very heavy. Anchorage may be obtained out of the strength of the tide in 10 to 12 fathoms, 1 mile East of the point, but caution is necessary.

Singapore Rock, on which the steamer *Singapore* struck in 1867, has 9 ft. on it, and lies 8 cables E.N.E. of *Low Islet*, at the extremity of a ledge of 6 to 17 fathoms, connecting it with *Low Islet*. The overfalls are very heavy around it. At 6 cables N.W. by N. of *Low Islet* is a rocky $2\frac{1}{2}$ -fathoms patch.

Yake yama saki, 8 miles S.E. of *Toriwi saki*, is a bold headland, very steep-to; about $2\frac{1}{2}$ miles S.E. of it are *Aka-gawa mura* and *Red Cliff*, two prominent points. The former low and green, the latter fronted by red cliffs about 100 ft. high. The coast is generally bold and rocky, backed by high densely wooded hills. *Minando mura* and *Ohata*, 4 miles S.S.E. of *Red Cliff*, are towns at the mouth of a small river, where junks load timber. The coast hence to *Uiya mura*, about 11 miles eastward, forms a bay with a sandy beach, free from dangers, with anchorage in 7 to 10 fathoms. *Cape Siriya saki* and its light-house are described on p. 853.

AWOMORI BAY, a vast interior basin at the North end of *Nipon*, opens on the South side of *Tsugar Strait*, the entrance being 5 miles wide, with high land on both sides. Some half-tide rocks lie 1 cable off the salient part of the West point. According to the Japanese, no hidden dangers exist. Towards the centre the water is too deep to anchor but at 2 miles from the East and West coasts there is generally 19 to 22 fathoms. Without a pilot or a chart it is not advisable to approach nearer than in 11 fathoms. There are numerous villages on the shores.

Awomori, at the head of the western part of the bay, appears to have from 15,000 to 20,000 inhabitants. The shore is bordered by a fertile plain of rice-fields, and a great quantity of rice is exported to Yezo. Beef, timber, and firewood can be obtained. The anchorage is open to the North, and 9 fathoms will be found at 2 cables from the shore, with good holding ground. It is high water, on full and change, at 2^h 58^m; springs rise 2½ ft.

Light.—A *fixed red* light, elevated 45 ft., and visible 6 miles, is shown from a white staff in front of the town.

Natsu sima, 12 miles N.N.E. of Awomori, is the extremity of the peninsula dividing Awomori Bay into two parts. *Shiranai Bay*, 5 miles to the S.E., is about 1½ mile in extent, but shoal water extends half a mile from its head.

Nofitsi lies in the S.E. bight of Awomori Bay. The anchorage is in a large semicircular indentation in front of the town, at 6 cables from the shore, in 6½ fathoms, gravel bottom. The town is half a mile from the coast; at the shore there is only a large village. There is a considerable traffic in copper here.

From Nofitsi the coast trends 25 miles northward to *Ando Bay*, near the head of which there is anchorage in 6½ to 8 fathoms. To the S.W. of the anchorage is *Port Ando*, a fine basin, sheltered by a bank of sand running parallel to the coast, with good anchorage in 3½ to 5 fathoms, mud, abreast the second village.

Cape Kusodomari, 18 miles S.W. of Ando, is the eastern point of the entrance to Awomori Bay. At 2 miles S.E. ¼ E. from it, and 5½ cables from the shore, are the two islets of *Ben-ten sima*.

CAPE YESAN, or *Esarmi*, on the South coast of Yezo, is the North point of the eastern entrance to Tsugar Strait, and the East extreme of a bold promontory, with several remarkable dome-shaped mountains in the rear. The cape itself is a steep bluff, about 600 ft. high, with some rocks off it; the volcano immediately above it is 1,935 ft. high, and frequently capped with a light cloud of steam. There is anchorage in the bay about 2 miles westward of the cape.

At 8½ miles S.W. by W. of Cape Yesan is *Conical Islet*, 200 ft. high, lying close to the high and cliffy coast. There is a dangerous low point 1 mile to the westward; and at 2½ miles to the eastward is *Foul Point*, which is low, with a dangerous reef extending 2 cables from it.

CAPE SIWOKUBI or *Blunt* bears W. ¾ N., 2½ miles, from Conical Islet; E. by S., 12 miles, from Hakodate Head; and N. by E. ¼ E., 9½ miles, from Low Islet, which is the narrowest part of the strait. This cape is steep-to, and the N.W. current frequently runs with greater strength close to the rocks than out in the stream. The summit of the bluff immediately above the cape is 1,022 ft. high; from thence the high land ranges in towards Saddle Mountain. The coast for about 7 miles to the westward is a level plain, elevated 200 or 300 ft.; beyond 7 miles it descends to the low beach connecting the high land of Hakodate Head with the main.

North Pacific.

HAKODATE HEAD is the South extreme of a bold peaked promontory, 1,136 ft. high, standing well out from the high land of the main, with which it is connected by a low sandy isthmus. The head is steep and precipitous, and safe of approach. At $4\frac{1}{2}$ miles West of the head is *Mussell Point*, off which a reef extends 2 cables, and is steep-to; the entrance to Hakodate Harbour lies between these points. The coast from thence to Cape Saraki, at $4\frac{1}{2}$ miles to the S.W., is level, but fringed with rocks, and requires caution in approaching. To the westward of the cape the shore is low, with a sandy beach safe of approach, and clean ground for anchorage to within 3 miles of Cape Tsiuka.

HAKODATE HARBOUR.—The port of Hakodate or Hakodadi, on the North side of Tsugar Strait, is situated at the foot of the northern slope of the high peninsula forming Hakodate Head. It is an excellent roadstead, 4 miles wide and 5 miles deep, and, for accessibility and safety, is one of the finest in the world. The harbour is in the S.E. arm of the bay, and is completely sheltered, with regular soundings and good holding ground, the best anchorage being in 5 fathoms, mud, in a line with the avenue leading to the Governor's house. A stony spit of $1\frac{1}{2}$ to 4 fathoms extends 1 mile northward of *Anama Point*, at the North extreme of the promontory. There is a large fort on this point.

This excellent port was thrown open to commerce by the treaty procured by Commodore Perry, U.S.N., March 31, 1854. The town lies on the N.E. slope of the promontory, facing the harbour. The appearance of the place is striking and picturesque, and in its position, general aspect, and many particulars, resembles Gibraltar. The town, which contained 26,908 residents in 1884, stretches for about 3 miles along the base of a lofty promontory, divided into three principal peaks of from 600 to 1,000 ft. in height, whose bare summits are often covered with snow. The European residents numbered 34. An excellent road connects it with Matsmai, 30 miles to the westward. The inhabitants are chiefly engaged in commerce and the fisheries, and carry on a large trade with the interior. More than a thousand junks have been seen at one time at anchor in the harbour. There is telegraphic and steam communication with other Japanese ports.

The principal exports are furs, sulphur, fish, herring oil, deer antlers, and edible sea-weed,* the latter in large quantities, but the trade is almost entirely in native hands. In 1883, only 34 foreign vessels, with a total tonnage of 13,571, entered here; in the same year 1,457 Japanese vessels entered, with a tonnage of 204,655, and 2,282 junks.

* "In its fresh state, the weed is in appearance much the same as the 'kelp' of Britain, in lengths from 20 to 40 ft. Two or three days of fine weather suffice to dry it, after which it is cut into lengths, usually 3 feet 9 inches, and tied in bundles of half a picul each."—*Capt. T. Blakiston, F.R.G.S.*

Supplies.—Water can be easily obtained from Kamida Creek, which enters the harbour to the north-eastward of the town, but the boats have to be dragged over the bar of the river. The Japanese supply fresh water in their own boats at a very moderate rate. A supply of wood and water may also be ordered through the Custom-house, at the bazaar, or from the American agents residing at Hakodate. The wood is suitable for steaming purposes, the proportion required being $2\frac{1}{2}$ times the weight of coal. Inferior coal is also procurable. Merchant vessels entering the port are subject to the Custom-house regulations.

The seino supplied the American Squadron, in 1854, with fine salmon and a quantity of other fish, and the shores abound with excellent shell-fish. Beef, potatoes, sweet potatoes, fowls, eggs, and all necessaries can be procured. For large supplies of provisions, masters of ships should have recourse to the American agents.

There are some shipbuilding yards here, turning out vessels of fair tonnage. Vessels, even when seriously damaged, can undergo repairs in the harbour; timber of any dimensions can be procured, and its price is very moderate. Expert and intelligent Japanese coopers, carpenters, and efficient blacksmiths are also procurable.

There is a brass and iron foundry, though worked on a limited scale. Ships' boats can be repaired or constructed by the Japanese in a very skilful manner from drawings.

Lightvessel.—A lightvessel, painted red, with two masts, the fore-mast carrying a ball, is moored in $7\frac{1}{2}$ fathoms, off the North end of Anama Spit, and exhibits a *fixed red* light, elevated 36 ft., and visible 10 miles. From the vessel the mouth of Kamida Creek bears E.S.E., and White Bluff S. by W. To prevent the light being hidden, vessels are forbidden to anchor within 5 cables, when the light bears between N. by E. and S.W., through East and South.

Fog Signal.—In foggy weather a *Bell* is sounded five times in quick succession at intervals not exceeding 5 minutes.

At 5 cables S. by E. $\frac{1}{2}$ E. from the lightvessel is a triangular floating *beacon*, moored in 5 fathoms; the passage between may be taken by vessels drawing less than 18 ft.

The banks of less than 3 fathoms, on the East side of the bay, extend half a mile from the shore, and must be avoided. Two white triangular *beacons* also mark the 3-fathoms edge of the bank on the western side of the inner anchorage; they are $3\frac{1}{2}$ cables apart, N. by W. $\frac{1}{2}$ W. and S. by E. $\frac{1}{2}$ E., in 20 ft.

A vessel can moor at a little over half a mile from the shore in $5\frac{1}{2}$ fathoms, mud, good holding ground. In less than that depth the bottom is gravel, and anchors hold badly.

Pilots.—Vessels entering the bay are boarded by pilots, who charge five Mexican dollars, without any distinction as to the size of the ship. There are no special harbour regulations.

Tides.—It is high water in the harbour, on full and change, at 3^h 37^m; springs rise 3½ feet, neaps 1 foot.

Directions.—Approaching from the eastward, after passing Cape Suwokubi, the junks at anchor will be visible over the low isthmus. Round the promontory of Hakodate, and giving it a berth of a mile, to avoid the reefs under the high land, steer for the sharp peak of Komagadaki, bearing about North, until the East peak of the Saddle, bearing about N.E. by N., opens to the westward of the round knob on the side of the mountain; then haul up to the northward and eastward, keeping them well open until the centre of the sand-hills on the isthmus bears S.E. by E. ¼ E. (these may be recognised by the dark knolls upon them). This will clear Anama Spit.* Round the lightvessel, passing northward of her, and haul to the S.E., anchoring as convenient in 6 to 8 fathoms, taking care to keep the lightvessel bearing westward of N.W. by N., to avoid the shoal bank off the town. Should the lightvessel be removed, bring the sand-hills a point on the port bow, and stand in until Anama saki, the western point of the town, bears S.W. ½ W., when you will have the best berth, with 5½ or 6 fathoms water.

If it is desirable to get nearer in, haul up a little to the eastward of South for the low rocky peak, which will be just visible over the sloping ridge to the southward and eastward of the town. A vessel of moderate draught may approach within a quarter of a mile of Tsuki Point, where there is a building-ground for junks. This portion of the harbour, however, is generally crowded with vessels of this description; and unless the want of repairs, or some other cause, renders a close berth necessary, it is better to remain outside.

Entering the harbour at night, bring the light to bear N.E. ¼ N., and steer for it, taking care not to bring it to bear North of that bearing. Round it as before directed, and anchor as convenient. Should the light be removed, steer a northerly course to a depth of 7 fathoms, and keeping in that depth on an easterly and south-easterly course the spit will be safely rounded.

Should the wind fall before reaching the harbour, there is good anchorage in the bay, in 25 to 10 fathoms water. During spring this harbour is subject to violent gusts of wind.

CAPE TSIUKA, at 11 miles S.S.W. of Cape Saraki, is a high cliffy point, which may be further known by three rocks extending a quarter of a mile from a point 1 mile north-eastward of it; the outer rock being of a conical form and 70 ft. high. The land to the westward for 4 miles is high and cliffy; about half-way between the cape and the end of the cliffs there are two waterfalls.

Vessels can anchor in the bight of *Fuku sima Bay*, between Capes Tsiuka and Sirakami; but as a southerly wind on the western tide sends in a cross

* If these leading marks should be in the clouds, as they generally are, keep the western extreme of Hakodate Promontory bearing South or S. ¼ W., which will clear the spit, and haul to the eastward when the centre of the sand-hills on the isthmus bears S.E. by E. ¼ E.
—Commodore the Hon. C. Elliot, *H.M.S. Sybille*, 1855.

swell, it would not be prudent to anchor far in. The best position is in 15 to 20 fathoms, about 1 mile East of the southern white cliff.

CAPE SIRAKAMI, or *Nadijeda*, the North point of the western entrance to Tsugar Strait, is a high bluff, similar to Cape Siwokubi, but not so safe of approach. The coast, for more than a mile on each side of the cape, is bordered with numerous rocks, generally above water, some of which run off nearly 2 cables. As the dangers may extend under water beyond this distance, it will be prudent to give the cape a good berth in passing.

From Cap Sirakami the coast trends W. by N. $\frac{1}{4}$ N., 5 miles, to *Cape Tadeisi*, which is low, and off it is a conical islet, with a small temple or building on it. The bay between is very rocky, excepting off the East end of the city of *Fukuyama* or *Matsumai*, once the capital of Yezo, where there is good anchorage in 12 fathoms at half a mile off shore; but this anchorage would, of course, be unsafe in southerly winds.

KO SIMA, about three-quarters of a mile in extent, lies W. $\frac{1}{4}$ S., $16\frac{1}{2}$ miles, from Cape Sirakami, and rises in three peaks, between which is an old crater. The western peak, which is slightly higher than the other two, is 1,009 feet high. Ko sima is precipitous, except on the eastern side, where landing may be effected. *Sugarloaf Rock*, 4 cables to the West, is 466 ft. high; between it and Ko sima are two smaller rocks, about 35 ft. high.

O SIMA, 2,359 ft. high, lies N.W. by W. $\frac{1}{4}$ W., 22 miles, from Ko sima. It has the appearance of an extinct volcano, and is $2\frac{1}{2}$ miles long, East and West, and about $1\frac{1}{2}$ mile in width; steep-to all round. These two islands form excellent marks for Tsugar Strait.

DIRECTIONS.—Sailing vessels approaching Tsugar Strait from the westward, during foggy weather, should guard against being carried by the current to the northward past the entrance. Should the weather be clear when nearing Cape Yokoi, it may be as well to sight it; but, if doubtful, shape a course (allowing for the probable current) direct for Oho saki. Should a fog come on suddenly when nearing this cape, recollect that the coast is clear and sandy, and the soundings are regular to the southward, but rocky with irregular soundings to the northward of it. The cape is steep-to, and, standing out prominently from the coast-line, forms a good landmark.

No particular directions are required in passing through this strait to the eastward, the only dangers being those off Toriwi saki, and Rattler Rock off Siriya saki (page 853), and the north-easterly current will always be found strongest in the middle of the stream.

Approaching the strait from the eastward, steer for Siriya saki, and endeavour to make it on a N.W. bearing. Pass the cape at not less than $2\frac{1}{2}$ miles distant, then haul in to avoid the current and to anchor, should it fall calm. In this case, by keeping this shore close aboard, the vessel may probably be drifted up to Low Islet, off Toriwi saki, by the western stream, when the N.E. current is running like a mill-stream in mid-channel.

At the anchorage off Low Islet the vessel must wait a favourable opportunity for crossing the strait. In summer the winds are generally light from the S.W. for a considerable period; the wind, however, generally freshens a little when the western stream makes, and this is the right time to weigh. In crossing the current, take care not to be set to leeward of Hakodate. If proceeding straight to Hakodate from the eastward, the better course is to cross the strait, and passing about 5 miles off Siritu saki, make for Cape Yesan, so as to take advantage of the cold westerly set along the South shore of Yezo.

Proceeding from Hakodate to the westward against S.W. winds, keep well inside Cape Tsiuka, and, if unable to round it, anchor with the stream or kedg about 2 miles to the N.E., weighing again when the next western tide makes. Should the wind be very light, a vessel may not clear the strait in one tide; in this case it will be better to wait a tide to the eastward of Cape Sirakami, and take the whole of the following tide to clear the strait, than run any risk of being swept into the strait again by the current. Vessels passing through the strait, particularly to the westward, should have a good kedg and 150 fathoms of hawser ready for immediate use, and must keep the land close aboard.

THE ISLAND OF YEZO.

This island, in its time, has been the object of much geographical discussion and criticism. The Dutch commander De Vries was the first to give a distinct notion of its existence and general character to the world. Subsequently the detailed researches made in the years 1787 and 1797, by La Pérouse and Capt. Broughton, and then the voyage of the *Nadiejeda*, by Capt. Krusenstern, in 1805, cleared up all doubts on the subject.

At the time of the first Japanese establishment in the island, the inhabitants, according to Golownin, called themselves *Einso*, from which word the names *Yezo*, *Jesso*, *Aino*, and *Insu*, are derived. The name of Yezo, or Jesso, has been adopted by most recent authors, because it is that by which it is most generally known by Europeans, although the name Aino is, beyond doubt, that given to the original inhabitants of the island.

Our first knowledge of the island was chiefly drawn from the notices of its original discovery in the Dutch ships *Castricum* and *Breskes*, under Captain De Vries, in 1643, from that of Laxman in 1792, from Capt. Broughton in 1796, from Capt. Rikord, of the Russian corvette *Dianna*, and from the observations of Capt. Krusenstern in 1805. The Strait of Tsugar has been surveyed by British and American officers, and has just been described. Interesting Papers by Commander H. C. St. John, H.M.S. *Sylvia*, and Capt. Blakiston, R.A., published in the Journal of the Royal Geographical Society, in 1872, and by Mr. R. G. Watson, in the same Journal for 1874, have added a great deal to our knowledge of this island.

The Island of Yezo is somewhat of a triangular form, the three extremities of

this triangle being Cape Soya, its North point, in lat. $45^{\circ} 31' 15''$ N., long. $141^{\circ} 54'$ E.; Cape Sirakami, the South point, in lat. $41^{\circ} 24'$, long. $140^{\circ} 12' 30''$; and Cape Noyshaf, its eastern extreme, in lat. $43^{\circ} 27'$, long. $145^{\circ} 50' 30''$. The coast-line is about 1,000 miles in extent, and its eastern shore appears low from seaward, resembling table-land. The western coast is bold, and ranges of lofty mountains rise in every direction, the highest of which is *Siribets*, a cone-shaped volcano. There are numerous rivers and streams, the largest of which, the Iskari, is on the West coast. Coal is found in several places, but is principally procured from the village of Kamami, near Iwani, on the West coast. Sulphur abounds. Little agriculture is carried on, the inhabitants principally subsisting on the produce of the ocean.

Want of harbours, or even anchorages, is the great drawback to Yezo. Considering Otarunai as a harbour, there are then four along the 1,000 miles of coast-line, namely, Hakodadi, Endermo (in Volcano Bay), Akishi, and Otarunai; and three anchorages possessing good shelter—these are Hamanaka, Nemoro, and Sutsini.—*Capt. H. C. St. John*.

The South Coast.—At $2\frac{1}{2}$ miles N.W. of Cape Yesan (page 857) is a bay affording good anchorage and shelter during westerly winds. *Udsuzeri Bay*, about 3 miles farther on, is a small indentation in the high shore, and shut in from the South by a low point from which rise three conical mounds. There is also a large conical hill at its head. Anchorage may be had in $4\frac{1}{2}$ fathoms, muddy sand, but there is a heavy sea with winds from N.W., round by North, to East.

VOLCANO BAY, to the northward of Hakodate, was visited and named by Capt. Broughton in September, 1796, and it was re-surveyed by the U.S.S. *Southampton*, one of the American expedition, in May, 1854.—(See Narrative, pp. 535—540.) They generally confirmed the description by Broughton, who thus speaks of it:—"I have seen few lands that bear a finer aspect than the northern side of Volcano Bay. The entrance into this extensive bay is formed by the land marking the harbour which the natives call Endermo, and the South point which they call *Esarmi*. They bear from each other N. 17° W. and S. 17° E., 11 leagues. There are no less than three volcanos in the bay, which induced me to call it by that name. There are 50 fathoms of water in the centre, and the soundings decrease on the approach to either shore. During our stay at the period of the equinoxes, we experienced generally very fine weather, with gentle land and sea winds from the N.E. and S.E., and no swell to prevent a ship riding in safety, even in the bay, and the harbour of Endermo is perfectly sheltered from all bad weather."

Mori Roads, on the southern shore at the entrance to Volcano Bay, affords anchorage fairly sheltered, except with strong easterly winds, at about 2 cables from the shore, in 6 fathoms. There is a breakwater for shelter of native craft abreast the village. There are several other villages on the shores of the bay, and from Oshambe, near the northern end, there is a road to Otatsutsu on the

N.W. coast. *Mount Siribets*, probably the highest mountain in Yezo, lies N.E. from Oshambe; it is a very fine peak of conical shape, and appears to be an active volcano. *Yulap* is a rather large Aino village, about 15 miles South of Oshambe; thence the coast curves to the S.E. to Yamakusanai, distant 5 miles, close to which, in a small valley about a quarter of a mile from the sea, and 1 mile North of Yamakusanai, is an iron foundry. Iron sand is found in abundance along the shore for miles, as far as Romanotake volcano. Silver and lead mines are situated in the Yulap valley, about 14 miles from the sea, and there are also petroleum springs near Yamakusanai. *Wasinoko*, 11 miles S.E. from Yamakusanai, is the largest village on the shores of Volcano Bay; it is situated on the top of the cliffs.

Endermo Harbour, on the northern side of the entrance to the bay, is about $3\frac{1}{2}$ miles long and $1\frac{1}{2}$ mile wide at its entrance between Daikoku sima and the shore of the bay on the North. There is also a passage 4 cables wide South of Daikoku sima, between it and the reefs off Yetomo saki. The town of *Sinmororan* stands at the head, towards which the shores are low and flat, so much so as to prevent boats landing within 100 yards; in all other parts wood and water are procured with the utmost convenience. There is a road hence to Sapporo, the nominal capital of Yezo. The chief export is fish and edible seaweed. Inferior coal may be obtained in small quantities, and there is telegraphic communication with Sapporo and Hakodate.

The small island near the head of the harbour was named *Hans Olason Island*, from one of Broughton's seamen who was buried there; the U.S. Expedition found the Japanese officials had carefully preserved the grave.

Light.—On a point on the western shore is a small square tower, from which is shown a *fixed bright* light, elevated 35 ft.

Kiumororan village, on the North side of the entrance, has a regular service of boats between it and Sawara, on the southern shore of Volcano Bay. West of Kiumororan the coast turns abruptly N. by W. towards Uszi volcano, with its jagged peaks and steep slopes, situated 2 to 3 miles from the beach; it has two peaks and a smaller pinnacle, both peaks being active volcanos.

A range of hills, 1,800 to 2,000 ft. in height, with three remarkable peaks on the highest ridge, indicates the situation of this harbour. In entering, steer to bring Daikoku sima to bear N.E., and then for it, passing about 2 cables northward of the island. When it bears South, alter course to E. $\frac{1}{2}$ S., until the lighthouse on the western shore bears South, when steer S. by E. $\frac{1}{2}$ E. for the bluff at the head of the harbour. Anchorage may be obtained in $3\frac{1}{2}$ to 5 fathoms, perfectly sheltered. It is high water, on full and change, at 4^h 35^m; springs rise 5 ft.

From Endermo Harbour the coast trends about 35 miles to E.N.E. to the village of *Yubets*, where deer are very abundant. About 10 miles inland is the extinct volcano of *Taromai*. *Urakawa Bay*, about 50 miles to the south-eastward, is an open anchorage, protected, however, from the S.E. by a reef.

Reefs and rocky patches also extend off shore northward of the anchorage, and great caution is required to anchor here. Between Yubetsu and Urakawa are *Saru* and *Sutsini*, where coal is found.

Cape Yerimo, the S.E. extremity of Yezo, in lat. $41^{\circ} 56' N.$, long. $143^{\circ} 16' E.$, is a rocky bluff, about 80 ft. high, the South extreme of a plateau stretching from the mountains. There are several pinnacle rocks close off the cape, and a reef of rocks, 10 or 15 ft. high, extends five-eighths of a mile S.E. There are several fishing villages here, and with westerly winds fair anchorage may be found on its eastern side.

Between Cape Yerimo and Akishi, a distance of nearly 90 miles, the coast stretches about N.E., slightly curving back, then trending more to the eastward, with not even an indentation along it. *Kusuri*, a Japanese fishing settlement, lies 20 miles West of Akishi; there is anchorage off it, with the wind off shore.

Akishi Bay, the *Bay of Good Hope* according to Jansen's chart, is a large basin of moderate depth of water, with a shallow lagoon at its northern end. There is a fishing settlement here, and some of the best edible seaweed is obtained in this neighbourhood. Wood and water are abundant.

The entrance, $1\frac{1}{2}$ mile wide, lies between the *Daikoku Islands* on the North, and the extremity of the reef extending 2 miles E. $\frac{1}{2}$ S. from the South point. The islands lie on a reef extending from the North shore. Near the North end of the bay, and on its East side, is Conspicuous Bluff, 250 ft. high, about 2 miles West of which is a rocky reef half a mile long N.N.W. and S.S.E., dry at low water. The land in the vicinity appears perfectly flat, and is thickly wooded. Two remarkable mountains are seen to the N.W., and others to the N. by E.

The depth gradually shoals from 14 fathoms at the entrance to $3\frac{1}{2}$ fathoms West of a steep bluff on the East shore, just over the settlement, a distance of $5\frac{1}{2}$ miles. In fine weather a convenient anchorage will be found in 7 fathoms North of Daikoku sima, with Ko Daikoku sima bearing East. With S.E. winds the best anchorage is in about 4 fathoms, in the N.E. part of the bay, and with S.W. winds, in the S.W. bight of the bay North of the South entrance point; a good berth is in 5 fathoms, 7 cables from the shore. It is high water, on full and change, at 6^h 30^m; springs rise 5 ft.

From Akishi the coast trends $7\frac{1}{2}$ miles E.N.E. to a remarkable pinnacle rock, about 80 ft. high, and from thence to Hamanaka or Kiritappu N.E. by E., 6 miles; the shore from Akishi, round Cape Noyshaf, to Nemoro, terminates in dark cliffs, backed by wooded table-land.

Hamanaka Bay, in lat. $43^{\circ} 5' N.$, is shallow, but it is a safe anchorage for a small vessel, behind the island of *Kiritappu sima*. Facing the bay are the islets Shiro iwa and Kuro iwa, connected by reefs.

The best entrance to this bay is between the rocks off the East point of

North Pacific,

Kiritappu and the West extreme of Kuro iwa; this passage is about three-quarters of a mile in width, with not less than 8 fathoms. Keep in mid-channel, and round Kiritappu half a mile off, anchoring in $3\frac{1}{2}$ to 5 fathoms, three-quarters of a mile off the large fishing village on its low flat N.W. point.

From Hamanaka the coast trends 16 miles, Σ $\frac{1}{2}$ N., to *Cape Usu*; reefs and dangers are believed to exist 2 miles off this coast.

The coast hence to Cape Noyshaf, the East extreme of Yezo, trends about N.E. by N., 18 miles, still gradually lowering and forming a narrow promontory. Two islands, 4 to 5 miles N.E. of Cape Usu, afford shelter behind them for junks. *Hana Bay*, about 7 miles northward of Cape Usu, is about a mile wide, and half a mile deep, and affords good shelter from W.S.W., round by North, to East. There is anchorage 3 cables westward of the East point, in 6 fathoms.

CAPE NOYSHAF, *Nossyam*, or *Broughton*,* in about lat. $43^{\circ} 27' N.$, long. $145^{\circ} 50\frac{1}{2}' E.$, is only 40 ft. high, and should be approached with the greatest caution, as reefs extend $2\frac{1}{2}$ to 3 miles off its South side, showing only during a southerly swell.

LIGHTHOUSE.—On the eastern extreme of Cape Noyshaf is a white hexagonal lighthouse, 35 ft. high, showing a *fixed bright* light, elevated 74 ft., and visible 10 miles seaward between W. by N. $\frac{1}{2}$ N. and S.S.W.

Fog Signal.—In foggy weather a *Bell* is sounded 12 times a minute, except during February, when the light is not shown.

Between Cape Noyshaf and Skotan Island, 50 miles to the north-eastward, are a group of ten barren and desolate islets, and numerous rocks and reefs, named *Walvis Islands* by De Vries, together extending about half-way from the cape. Of these islands only Skotan and Sibutts or Taka sima have a few Japanese settlers on them. Numerous reefs and rocks extend eastward of Cape Noyshaf, with a clear channel, *Go-yo-mai Strait*, between the westernmost reef and the cape, $1\frac{1}{2}$ mile in width. The dangers off the cape, and the group of islands mixed up with reefs and rocks, cause this narrow pass to be most dangerous, and fogs coming on suddenly add much to the difficulty and danger; the currents also are strong. The channel, therefore, between Skotan and Taroko, which is apparently clear of danger, is recommended in preference.

Walvis Bay.—From Cape Noyshaf the coast trends West, 8 miles, to a sharp rocky point, with a rock 2 cables off it, from which it trends S.W. by S., 5 miles, to Nemoro, and for 5 miles beyond it. The coast then gradually rounds to West, N.W., and North, which is its trend at Nishibets, and this continues on to the curious hook-shaped spit of Notske, 8 miles N. by W. from Nishibets. This large bight has a depth of not more than 16 fathoms in it, and is known as Walvis Bay; Krusenstern named it *Lazman Bay*.

* Admiral Krusenstern says:—"In honour of the English navigator who has, with a slight exception, made the circuit of the Coasts of Yezo, and first determined the geographical position of its eastern extremity, I have named it Cape Broughton."

NEMORO, the only place on the N.E. coast of Yezo with any pretensions to an anchorage, is in lat. $43^{\circ} 20\frac{1}{2}'$ N., and is formed by a small island, *Benten sima*, lying across a bay, and thus affording fair shelter for one vessel of light draught. In the entrance midway between the island and point, 2 cables wide, there is a depth of 6 fathoms, shoaling rapidly to 4 fathoms. Wood, water, and fish are plentiful. The climate is cold, and fog is constant all the summer. The land about Nemoro is not more than 100 ft. in height; to the southward, swamps and lagoons back the stony beach.

Light.—On the N.E. point of *Benten sima* a *fixed red* light, elevated 75 ft., and visible 6 miles, is shown from a white mast 40 ft. high; in February it is not exhibited.

Nishibets River, though small, is a very important salmon river, and between it and Nemoro are several other fishing stations. In 1869 not less than 1,000 tons of salmon were exported from this river.

Notske Spit, in lat. $43^{\circ} 33'$ N., is a low and flat wooded tongue of land shaped like a hook, projecting about 6 miles from the land, and enclosing on its South side a shallow bay where only boats can float. There is a small temple on its extreme S.E. edge. The anchorage off Notske affords shelter from winds from the westward, but it is open to the East.

Shibets, 11 miles from Notske by sea, is a considerable fishing station at the entrance of a river. The anchorage is open to the N.E., and but little wind from that quarter, or East, produces a nasty sea. The country is very low and flat until past Shibets, from whence it rises suddenly into a grand lofty range of mountains, which terminate in Cape Sirotoko.

Cape Sirotoko, or *Spanberg*, the N.E. extreme of Yezo, is in lat. $44^{\circ} 18'$ N., long. $145^{\circ} 23'$ E. It has two remarkable points, one forming the eastern extreme, the other the northern; at 2 cables off the latter is a rock about 30 ft. high.

YEZO STRAIT, separating Yezo from the island of Kunashir, is about 20 miles wide at either entrance, narrowing to 9 miles off Notske Bay; at which place a shoal ridge, having 10 fathoms deepest water, extends across the strait. Northward of Shibets the water deepens quickly. Great caution is necessary when proceeding through these straits, sudden patches of shoal water being frequent. Between the S.W. point of Kunashir and Notske Spit the depth is irregular, starting with 4 fathoms off the point, deepening to 6, shoaling again to 4, and again deepening to 11 fathoms at $1\frac{1}{2}$ mile off Notske Spit, at which distance, probably, the best channel runs through the straits. In December, ice forms to a considerable distance from the shore.

The North Coast of Yezo, between Capes Sirotoko and Soya, trends about 200 miles to N.W. Its prominent features are: a high mountainous district near Cape Sirotoko; a low shore skirted with numerous lagoons westward of Share; a high bluff near Yessasi; and thence towards Soya a comparatively low fir-wooded country. There is a total want of harbours along its entire

length, and no detailed survey has been made.—(Captain T. Blakiston.) In winter the sea along this shore is said to be frozen for 6 or 8 miles out.

Share Bay is formed on the East by the high promontory of which Cape Sirotoke is the extreme. At its head is the village of *Share*, situated on the bank of a river. There is said to be an extensive bed of pure sulphur near the sea between Share and the cape. Inland, bearing S. $\frac{1}{2}$ E. from Share, is a high double-peaked mountain.

Abashira, a fishing station about 20 miles north-westward of Share, is situated on the South shore of the bay, at the mouth of a river. Fronting the village is a curious reef of rocks. Anchorage in 5 fathoms may be had with off-shore winds on either side of the reef. A bank of $1\frac{1}{2}$ fathom extends from the reef to the river. The country is of moderate height, 500 or 600 ft.

From Abashira the coast trends northward for about 5 miles to *Cape Notoro*, 12 miles westward of which is *Tokoro*, a small fishing station at the mouth of a river. About 2 miles westward of Tokoro is the outlet of the most extensive lagoon on the whole coast, containing large oyster-beds. *Fubets*, a small fishing station a short distance westward of the extreme West end of the lagoon, is situated in a swampy district.

From Cape Notoro the coast trends N.W. by W. $\frac{1}{2}$ W. for 44 miles to a low point, just inside which is the settlement of *Mombets*, the head-quarters of the district. With the wind off shore a vessel can anchor in 5 fathoms, 1 mile off the settlement.

The coast from Mombets to Cape Soya, a distance of 90 miles, trends about N.W. by N. *Sawaki* is a small fishing station about 20 miles N.W. of Mombets. The coast between is fronted by a low sandy beach.

The coast N.W. of Sawaki is irregular and rocky, and skirted by reefs. *Horonai*, a small salmon fishing station, lies about 12 miles N.W. of Sawaki, and *Chuskiu Islet*, about 1 mile off shore, lies 3 to 4 miles N.W. of it.

The West Coast of Yezo, from Cape Sirakami (p. 861) to Cape Nossyab, is comparatively little known, and has but few good anchorages. The best is Otteranai in Iskarri Bay, between which and Hakodate there are no anchorages, except with an off-shore wind, and then only at Sutt Bay and Cape Rodgers. *Cape Rodgers*, or *Su ne go*, a prominent, low, green point, in lat. $41^{\circ} 48' N.$, forms a bay on its North side, with convenient anchorage in 7 or 8 fathoms, sheltered from N.E. or S.E. gales.

Yesasshi, in lat. $41^{\circ} 52'$, is the principal town on this part of the coast, and is said to contain 10,000 inhabitants. Off it lies *Kamone sima*, a small rocky islet almost connected to the land by a sand-bank, forming an excellent shelter for numerous junks. Larger vessels may anchor in 7 or 8 fathoms, with the North end of Kamone sima bearing about S.W.; they should, however, leave if the weather threatens to be heavy from the westward. At $4\frac{1}{2}$ miles northward is the town of *Odobe*, at 1 mile North of which is a white cliff 210 feet high. *Made ica*, 3 miles North of Odobe, is a dark pillar of rock, 70 ft. high.

Sibi no saki, 4 miles farther on, is a low, prominent point, at 1 mile North of which, and close to the shore, is a round rock 35 ft. high. From *Sibi no saki* the coast trends to the N.N.W., for about 6 miles, to a white cliff, and is composed principally of sandy beaches. At 4 miles westward is *Seki nai no saki*, in lat. $42^{\circ} 8'$, whence the bold coast trends N.N.W. for about 6 miles to Kudo Bay. A rock, awash, lies $1\frac{1}{4}$ mile North of *Seki nai no saki*, and half a mile off shore. *Kudo Bay* has a white sandy beach, with anchorage in 8 to 10 fathoms. Northward of *Ota saki*, $5\frac{1}{2}$ miles N.W. of Kudo Bay, the coast is very bold and precipitous, with deep water close-to, and backed by densely-wooded mountains.

OKUSIRI ISLAND, 9 miles off the West coast of Yezo, the channel between being very deep, is for the most part densely wooded, and rises gradually to a height of 1,955 ft. Between the summit and the North point are two moderately-sharp peaks. From the northern peak the land declines gradually to the North point, *Gomiga saki*, which is low and tapering, with a small round hillock, 237 feet high, about half a mile from the extreme point. A reef extends about half a mile off this point. The population, in 1881, was about 300 Japanese, and a few Ainos, who earned a precarious livelihood by fishing.

The East coast of Okusiri is almost straight, and steep-to. The West coast is rugged, and low rocks extend nearly half a mile N.W. of the N.W. point. A conical islet, 300 ft. high, lies near the South end of this coast, and rocks also extend off the shore.

Awana no saki, the South point of Okusiri, is low and tapering, curving slightly to the eastward, and foul rocky ground extends 3 miles southward of it, terminating in *Morotsu no sima*, a group of black lava rocks, about 25 feet high, and surrounded by foul ground. These rocks should invariably be given a berth of at least 2 miles.

On the eastern side of *Awana no saki* is a bay, with a sandy beach, fronted with shelving rocks, well protected from all winds between S.W. and North, through West. Anchorage may be obtained in 8 to 10 fathoms, sand, with the small temple, over the South end of the village, bearing about W.S.W. or West. Easterly winds send in a heavy sea. It is high water, on full and change, at $3^h 30^m$; springs rise about $1\frac{1}{2}$ foot. As a general rule there is a steady set northward.

The Coast from Cape Ota, opposite the North end of Okusiri, is bold and steep-to, and trends about N. $\frac{1}{4}$ E., for 20 miles, to *Cape Sutsuki* or *Kutusoff*; thence it trends E.N.E., 20 miles, to *Bekhei misaki*, the West point of Sutt Bay.

Sutt Bay, in lat $42^{\circ} 48'$, is about 4 miles wide, and 3 miles deep. It is open to winds between N.E. and N.W., but anchorage may be had in fine weather either at its head, in 7 fathoms, at 6 cables from the beach; or on the western shore off Sutt village, in about 13 fathoms, at $3\frac{1}{2}$ cables from the shore. The distance across to the head of Volcano Bay is only about 13 miles.

Siru-unku Bay lies 15 miles N.E. of Sutt Bay, a short distance northward of an enormous cliff known as Raiten. There is a coal mine 5 miles inland from the northern arm of the bay, where there is a fair anchorage, and lighters can load easily. The coal, which is of good quality, is conveyed to the coast on tramways. Off shore, 2 miles from the point dividing the bay into two parts, is a sunken 6-ft. rock. The settlement *Iwani* is in an open bay, sheltered only from easterly winds.

Cape Novosilzov, 22 miles North of Iwani, is the N.W. point of a high bold promontory which projects 20 miles to the N.W. It is 15 miles across, and its summit, *Mount Shakotan*, rises to a height of 4,287 ft.; off the cape are several rocks. At 7 miles E.N.E. is *Cape Taka sima*, the North extreme of the promontory. To the N.E. of this promontory is the large bay named *Strogonoff* by Capt. Krusenstern in 1805. At *Maloyama Bay*, 9 miles S.E. of Cape Taka sima, there is anchorage off the village, in 9 fathoms, at about half a mile South of the N.W. point, open to the N.E. Small vessels can anchor farther in, in 7 fathoms.

LIGHTHOUSE.—*Cape Skudutzs*, or *Hiyori yama*, is the termination of the rocky ridge of *Kawasiri yama*, 1,215 ft. high. On it is a white lighthouse, 33 feet high, showing a *fixed bright light*, elevated 162 ft., and visible 17 miles seaward between W.N.W. and S. $\frac{1}{2}$ E.

Iskarri Bay is the large bay eastward of Cape Skudutzs. From Cape Skudutzs the coast trends southward for $1\frac{1}{2}$ mile, and then curves to the westward and southward for $2\frac{1}{2}$ miles, forming *Tamiya* and *Otaru Bays*, separated by a sandy point with a hill over it 204 ft. high. There are villages on both these bays, the important settlement of *Oterranai* being on the southern one. This is the only safe anchorage on the N.W. coast of *Yezo*, and is the port of *Iskarri*, the greatest salmon fishery in the island. The bay is open to the eastward, but is well sheltered between N.W. and S.E., and is at all times safe. After rounding Cape Skudutzs, steer into the bay, bringing the easternmost bluff to bear N.E., or farther in for a smaller vessel. The great resource of *Oterranai* is its herring fishery; about 6,000 tons of herrings annually are dried and exported. They are also boiled down for manure. Edible seaweed is also procured.

A wooden pier, 1,440 ft. long, runs out into a depth of 21 ft. water, alongside which vessels can load and unload. From hence a railway runs to *Sapporo*, 22 miles inland, the nominal capital of *Yezo*. It thence extends to the *Poronai* coal mines, a total distance of $56\frac{1}{2}$ miles, completed in May, 1883.

Iskarri is a fishing settlement about 15 miles East of *Oterranai*, at the mouth of the largest river in *Yezo*, and noted for its salmon. In summer there is a depth of about 10 ft. on the bar; and inside there is 6 and 7 fathoms. Large numbers of junks come here, over 3,000 tons of fish being exported annually. The river is said to be navigable for light-draught vessels a great distance. A vessel may anchor outside the bar, much exposed to westerly winds. Fire-

wood can be obtained in any quantity, and coal has recently been discovered in the vicinity.

From Oterraai to Cape Nossyab, a distance of 155 miles, the coast is bold and rocky, without a harbour or sheltered anchorage, but with numerous fishing stations along it. Northward of Iskarri, as far as *Cape Buyimawas*, it is for the most part high and precipitous. On the North side of *Cape Kamoieto*, or *Ofuwi*, or *Malaspina*, 9 miles northward of Cape Buyimawas, is a lofty red cliff. The shore, to about 2 miles West of Maski, is precipitous, but then becomes comparatively low. *Maski* is 12 miles N.E. of Cape Komoieto, and 10 miles farther on is *Ruomopi*, a considerable settlement, situated in a small bay open to the N.W. *Obiraspi River* enters the sea about 6 miles North of *Ruomopi*; about 24 miles up it coal of an inferior quality has been found. *Tomomai*, about 18 miles northward of *Obiraspi River*, is a comparatively large settlement situated at *Shishkoff Point*. *Furibets* is an old fishing station, about 16 miles northward, and 10 miles farther on *Wimbets River* enters the sea, the coast between being low. The coast from a short distance South of *Wimbets* rises, and the shore is skirted by a straight line of yellow cliffs 200 to 250 feet high.

Yagisiri and Taruri Islands, lying at 13 and 18 miles N.W. from *Tomomai*, are 354 and 577 ft. in height respectively; there is said to be a small village on one of them.

Teshiu River, about 9 miles North of *Wimbets*, is a considerable stream, with a fishing station about a mile South of its entrance. Hence a dreary straight wooded coast extends northward as far as the high land a little South of *Bakai*, a fishing station about 13 miles South of Cape Nossyab. Underneath a hill at the back of *Bakai* village is a peculiar rock on a hummock. Quantities of drift-wood are found along this shore, and a monster species of crab is also to be met with about here. Enormous quantities of herrings are caught in spring.

CAPE NOSSYAB, or Romanzoff, and Cape Soya, at the North extremity of *Yezo*, together with the Strait of *La Pérouse*, which separates *Yezo* from *Saghalin*, have been described previously on pp. 755-7, with the islands of *Refunsiri* and *Risiri*, lying to the westward.

THE WEST COAST OF NIPON.

The West coast of *Nipon* is comparatively little known, and should therefore be navigated with necessary prudence and caution. The only parts at present surveyed are the islands *Sado*, *Awa sima*, and *Tabu sima*, and the strait between *Sado* and *Niigata*, by H.M. ships *Actæon* and *Dove*, in 1859. The coast from *Tsugar Strait* (page 855) to *Rokko saki* or *Cape Noto* has been partially explored by the *Bittern* and other of H.M. ships, the Russian gun-vessel *Djigit*, and H.M. surveying-vessel *Saracen*. The latter vessel also ex-

explored the coast between the western entrance of the Inland Sea and Takayama or Cape Louisa, in lat. $34^{\circ} 40' N.$

The coast between Cape Louisa and Sado is not often even sighted by European ships; its coast-line has been taken from the Japanese manuscript, and may, with the exception of possible dangers off it, be regarded as accurately delineated.

The coast from Cape Yokoiso (p. 855) to Niigata, a distance of 180 miles, trends due South to Oga sima Peninsula in about lat. 40° , and thence takes a general S.S.W. direction to Niigata. Anchorage may be obtained with off-shore winds at *Sakata* in $38^{\circ} 58' N.$, and at *Hamo* 11 miles southward. It is also probable that there is shelter on either side of Oga sima Peninsula.

BITTERN ROCKS.—This group of three small rocks, two above water and one awash, was discovered by H.M.S. *Bittern*, 8th July, 1855. They lie close together, within the space of 2 cables, steep-to on their western side, having 15 and 17 fathoms at the distance of 2 cables, and no bottom with 140 fathoms at $1\frac{1}{2}$ mile. The rocks were covered with seals. The south-western or largest rock, in lat. $40^{\circ} 31' N.$, long. $139^{\circ} 31' E.$, and lying W. by S. about 19 miles from Cape Yokoiso or Gamaley, is about 12 ft. high, the smaller one lying rather more than a cable to E.N.E., and the third rock, awash, lies to the S.E.

Tabu sima, about 10 miles off the coast, is in shape somewhat like a horse-shoe, with a club at its N.E. end. It is nearly flat, varying from 120 to 150 feet in height, and is $1\frac{1}{2}$ mile long N.E. and S.W., its widest part, the N.E. end, being not quite a mile across. The island is surrounded by detached rocks, except on its S.E. side. No supplies could be obtained, except a few fish; the inhabitants export large quantities of dried squid. Springs of excellent water abound. Observatory Rock, off its East extreme, is in latitude $39^{\circ} 11' 53'' N.$, long. $139^{\circ} 34' 17'' E.$

The *Actæon* anchored in 25 fathoms off the bay on the S.E. side, with the South extreme of the island bearing S.W. by W. $\frac{1}{2}$ W., and Observatory Rock N.N.E. The gun-vessel *Djigit* anchored in the same bay in 9 fathoms, coral. It affords shelter from all winds prevalent in the Japan Sea.

Awa sima, the N.E. extreme of which is in latitude $38^{\circ} 29' 36'' N.$, long. $139^{\circ} 16' 7'' E.$, is a narrow island running N.N.E. and S.S.W., and reaching at its southern extreme an elevation of 680 ft. It lies about 10 miles off the coast, and is $3\frac{1}{2}$ miles in length, and nearly a mile in breadth, the widest part being in the centre, where, on the East shore, is a fishing village, while another stands at the South end of the other shore, in a small bay protected by a natural breakwater. The S.E. side is fringed with a narrow bank of soundings, the only anchorage; the remainder of the island is bordered by reefs and rocks. At nearly a mile N.N.W. of the North point is a dangerous rock, on which the sea sometimes breaks. The inhabitants were, as well as at Tabu sima, very civil. Nothing but fish could be obtained.

SADO ISLAND, lying 25 miles westward of the important trading port of

Niëgata, is 33½ miles long, N.N.E. and S.S.W., nearly 17 miles at its widest part, and is composed of two parallel mountain ranges lying N.W. and S.E. of each other, the neck of land joining them being a plain, on the N.E. and S.W. sides of which are formed two extensive open bays. A remarkable sharp conical hill, 700 ft. high, stands on a flat off the North extreme of the island, and from a distance looks like an isolated rock. To the northward of this are a few detached rocks close to the shore, and one off *Ya, Wa, or Hadiki saki*, the N.E. point of the island, which is in lat. 38° 19' 55" N., long. 138° 30½' E.

This latter point rises somewhat abruptly, and attains an elevation of 3,800 feet, from which the land, descending slightly, runs in rocky ridges to the S.S.W. for 10 miles, and terminates in a sharp nipple 4,500 ft. high, whence it descends in a gentle uniform slope to the southward. The shores are generally cliffy and steep-to, a berth of three-quarters of a mile clearing all known danger. The West point of the island has a bold, clean shore, whence the coast recedes round Sawa-umi Bay to the S.E., and is low. There are numerous fishing villages along the western shores, and a few boat harbours were seen. At *Aikawa* are some gold and silver mines.

The bend in the coast-line on the N.E. side of the island forms an extensive bay called *Minato-mats*, which affords anchorage in 12 to 16 fathoms, sheltered from E. by S., round South and West. to North. The town of *Yebisu* or *Ibesso* lies at its head; a small *light* is shown here. A conspicuous rock, 60 feet high, called *Siza*, marks *Okawa Point*, the South extreme of this bay. Fresh beef may be obtained here. It is high water, on full and change, at 5½; springs rise 2 feet.

Anchorage will also be found off *Oda* village, a quarter of a mile S.S.W. of Matsuga saki, a low projecting tongue of shingle, bearing S.W. by S. ½ S., distant 10½ miles from Okawa Point, but it is open, and the water deep. *Ogi Bay*, on the East side of Sawa saki, only affords anchorage for small craft.

A few fowls, some fish, and vegetables were obtained by the *Actæon* during her stay at Sudo. Firewood may be obtained, but it is supposed not in sufficient quantities for steaming purposes. Nearly every little valley has its stream of excellent water flowing down to the beach. Coal is not known.

NIEGATA.—The city of Niëgata stands on the left bank of, for Japan, a rather large river, the *Shinano gawa*, with 4 fathoms water within the entrance; but at present a bar closes it to vessels of over 7 or 8 ft. draught. In fresh breezes from seaward the sea breaks across the entrance, and at that time not even a boat could cross the bar without risk. The roadstead off the mouth is quite exposed, and the holding ground bad.

Niëgata, one of the ports open by treaty to foreign trade, is the most opulent city on the West coast of Nipon. It contains about 38,000 inhabitants, and appears to absorb nearly the whole junk trade of that side of the island, but it is not adapted for foreign vessels. Supplies of all kinds may be obtained

North Pacific.

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here, but the water is bad. The best landing place for boats is near the lighthouse.

LIGHTHOUSE.—On the West side of the river entrance is a black lighthouse, 52 ft. high, showing a *fixed bright* light, elevated 69 ft., and visible 9 miles. Lat. $37^{\circ} 56' 26''$ N., long. $139^{\circ} 3' 56''$ E. It is reported as not always to be depended on.

The city, which is of great extent, is intersected by canals crossed by bridges, their banks shaded by weeping willows. It is surrounded by gardens of pear trees, peaches, vines, and vegetables, and is situated on an extensive alluvial plain, intersected by many rivers, which fall near the coast into the Sinano gawa, which takes its rise about 120 miles to the southward. This low coast extends for 42 miles, and presents an even appearance, dotted with trees and houses. When bearing South, or S.S.W., it is seen clearly intersected by the river entrance, filled with junks; from other directions their mast-heads are visible over the land, one fleet of them lying just within the entrance, and another more to the southward, off the city. Farther to the East, on a small elevation, is seen the town of Aosima yama, and high mountains rise inland.

Soundings reach to a considerable distance off the mainland in the vicinity of Niigata; vessels, therefore, running between Sado and Nipon at night, or in a fog, should keep the lead quickly hove. Should soundings be obtained and decrease gradually, the mainland is being approached. A run of very deep water will be found on the Sado side of the channel.

The U.S.S. *Shenandoah*, Commodore J. R. Gouldsborough, anchored off the city in 1867, in 10 fathoms, mud and fine black sandy bottom. A depth of 7 fathoms is found at a mile from the bar.

Anchorage.—No vessel, except a powerful steamer, could, during the autumn or winter months, remain at anchor off the port, as gales of wind, commencing at S.W. and veering to N.W., rapidly succeed each other, and send in such a heavy sea that no ground tackle could be depended upon, and the holding ground is very indifferent. Under these circumstances, the most prudent course to adopt would be to anchor under shelter of Sado, and await a favourable opportunity, or have the cargo transported to or from Niigata in junks or light-draught steamers.

The bar is formed by a shifting sand-bank, extending from half a mile to a mile off the land. In 1867 the bar had two boat channels; the one to the East is deepest, with 8 ft. at low water. It is proposed to improve the entrance by forming two channels 600 ft. long and 21 ft. wide, with a depth of 18 ft. at low water.

From the mouth of the river, which is about 3 cables wide, the left bank is sandy, and first turns S.S.W. and then S.W. up to the city. The right bank is sandy at the entrance, then marshy, but steep; it trends S.E. by S., and then runs parallel to the left bank. The broadest part of the river is 6 cables, opposite the second bend. The current ran $2\frac{1}{2}$ knots.

Tides.—For the distance of 4 miles a strong indraught, on the flood tide, is experienced off Niëgata, greatly to the inconvenience of sailing vessels seeking an offing. The ebb would assist them off the land. It is high water, on full and change, at 3^h 10; springs rise 1½ foot.

The town of *Aosima yama* stands near the embouchure of a river, which also has a bar carrying only 7 ft. It is said to be 6 miles N.E. of Niëgata, but is only half that distance, according to the Japanese manuscript.

From Niëgata to Toyama Bay, 120 miles to the S.W., the coast has not been surveyed. At 15 miles S.W. ¼ W. from Niëgata the low shore terminates at *Kadota-yama Head*, 4½ miles North of a spur of the fine peaks of *Yahiko yama*, which has the appearance of a blunt cone sloping on the West. A mile to the South the peak of *Kauriko yama* rises to a higher elevation.

TOYAMA BAY.—The coast to the S.W. of *Yahiko yama* is very high, especially near this bay, where the three snowy peaks of the *Sa-yama Mountains* appear above the clouds. *Rokko saki* or *Cape Noto* is the western point of entrance to this extensive bay, which is broadly open to the North and N.E. The *Djigit* passed along its eastern and southern shores, both of which are very populous. Some rivers flow into the bay, but having bars they are not accessible to ships. All the anchorages off the villages are more or less exposed to winds from the northward. The *River Gensiu gawa*, on which the town of *Toyama* stands, has a bar of 7 ft. water completely across it. This bay is in every respect inferior to the roadstead off Niëgata, and with strong northerly winds more difficult to quit.

On the western shore of the entrance to the *Imizu gawa*, 7 miles westward of the *Gensiu gawa*, stands the town of *Fushiki*, *Honotsu*, or *Shinminato*, off which there is anchorage with off-shore winds, in 6 fathoms, on a bank extending about a mile from the shore. Vessels should not anchor with the lighthouse bearing westward of S.W., as the bank is very steep-to. There is good anchorage in 5 fathoms with the lighthouse bearing S.W. by S. ¼ S., distant about three-quarters of a mile.

The LIGHTHOUSE, on the N.W. side of the entrance, is a white hexagonal building, 38 ft. high, showing a *fixed bright light*, elevated 38 ft., and visible 10 miles.

Nanao Harbours, on the West side of Toyama Bay, are formed by a large bight, which is divided into two inlets by the large island *Noto jima* or *Sima-no-chi*, lying East and West. *North Harbour* is easy of access, and clear of dangers, affording excellent shelter in either of the inner bights in its N.W. corner; the entrance is about 1½ mile wide, but a bank of 6 to 9 fathoms lies immediately outside it. *South Harbour*, though wide and capacious, is much encumbered with reefs, and its entrance, which is from half to three-quarters of a mile wide, is much contracted by several rocky shoals. In the middle of the outer part of the entrance is a rocky bank of 3 to 6 fathoms, outside which, in 9 fathoms, a vessel can temporarily anchor to obtain a pilot.

Miyose Rock, with only 2 ft. on it, lying North of the centre of the channel, is the principal danger, and must be left on the port hand on entering. Two reefs, each 1 cable long, and with 6 ft. water on them, are said to lie 5 miles East of the entrance. The town of *Nanao* is situated in the extreme southern angle of the bay, and in the main channel the soundings gradually decrease from 14 fathoms at the entrance to the anchorage off the town. A ship-yard was being built to the eastward of the town, and there are some small iron-works here.

Two small islands, *Ojima* 3 ft. and *Mejima* 9 ft. above water, lie about 2 miles from the town. There is deep water to the eastward of them, but W.N.W. from *Ojima*, the western one, a 16-ft. shelf extends $5\frac{1}{2}$ cables. By keeping the western shore on board on entering, and passing about a quarter of a mile from the only bluff point on the western side, the water will shoal gradually from 7 to 4 fathoms, mud. The rise of tide is very insignificant.

There are no peculiar features of the coast, or landmarks, to denote these entrances from seaward. They may, however, be readily seen by their open space.

Directions.—To enter, bring the middle of the southern entrance to bear W. by S. $\frac{1}{2}$ S., and then run for it. After entering the channel, keep close over to the North shore, running parallel to a line passing through Channel Bluff and *Matsu saki*, which will be a course about W. by S. $\frac{1}{2}$ S.; but do not get inside the bight between the two points, for there is a 3-ft. shoal there bearing S. by W. from a small village. In passing through the channel South of Channel Bluff, between Fairway Bank and *Fukura saki*, borrow on the northern side, which may be approached quite closely, and steer in towards the harbour S.W. by W. $\frac{1}{4}$ W. From Channel Bluff steer S.W. by W. $\frac{1}{4}$ W. until the North side of the square cliff (*Ota*) is in line with the East end of *Mejima*, then steer S.W. $\frac{1}{4}$ W. until the North end of the square cliff is in line with the centre of *Ojima*, when steer S. $\frac{1}{2}$ E. until the centre of *Ota* bears E. $\frac{1}{2}$ N., where a good anchorage will be found in $4\frac{1}{2}$ fathoms, about the centre of the harbour. The danger to be avoided in entering this harbour is a 16-ft. spot 850 yards from *Ojima*, and in line with that island and the North end of *Ota Cliff*.—*Commodore Gouldsborough, U.S.N.*

ROKKO SAKI, *Cape Noto*, or *Roiven*, the northern point of *Noto Peninsula*, is elevated about 700 or 800 ft., the land rising 1,200 to 2,000 ft. to the westward of it. At 12 miles W. by S. from the cape is a remarkable white cliff that shows well to the westward; from this cliff the coast bends in to the southward and forms *Waisima Bay*. The opposite point of the bay is about 8 miles distant, and immediately above it is the sharp peak of *Wasisu yama*, 2,000 ft. high, the highest point in the neighbourhood, the land being generally level, and of the uniform height of about 800 or 1,000 ft. At 10 miles W. by S. from *Waisima*, or 30 miles W. by S. from *Cape Noto*, the coast at *Isonosu*, a prominent projecting hill, 800 ft. high, trends away sharply to the southward.

LIGHTHOUSE.—On Rokko saki is a white lighthouse, 26 ft. high, showing a *fixed bright* light, elevated 152 ft., and visible 18 miles seaward between W. by N. and S.E. $\frac{1}{2}$ S. Lat. $37^{\circ} 30' N.$, long. $137^{\circ} 19' E.$

Hime sima Reef, south-eastward of Rokko saki, is about 3 cables long, N.E. and S.W., part being above water, *Isono sima*, the S.W. rock, lying nearly 5 cables E. by N. from Ai saki. *Aroostook Reef*, a dangerous reef, lies nearly N.W. by N. $\frac{1}{2}$ N., 10 miles, from Rokko saki, with the northern Astrolabe Rock bearing W. $\frac{3}{4}$ S. Another reef is reported to lie 6 miles to W.N.W.

Yutsi sima, in lat. $37^{\circ} 50\frac{1}{2}' N.$, long. $136^{\circ} 55' E.$, is 40 ft. high, about two-thirds of a mile in diameter, level, and cultivated; there are a few stunted trees on it, and a small village on its southern side.

Nana sima, or *Astrolabe Rock*, in lat. $37^{\circ} 35' N.$, long. $136^{\circ} 54' E.$, is 200 ft. high, and about a quarter or a third of a mile in diameter; it is the largest and highest of a group of five rocks, which extend nearly $1\frac{1}{2}$ mile N.E. and S.W., and vary from 200 to 70 ft. in height. A sunken 3-ft. ledge is said to lie between Astrolabe Rocks and Waisima, $2\frac{1}{2}$ miles from the latter.

Mikuni Roads, about 75 miles to the S.S.W. of Isonosu, is in lat. $36^{\circ} 13' N.$, long. $136^{\circ} 8\frac{1}{2}' E.$, there being no known anchorage between. The U.S.S. *Shenandoah* came here in 1867.

The approach to Mikuni Roads is bold to within half a mile from the shore, when the soundings vary from 9 to 6 fathoms.

The anchorage in the Outer Roads is exposed from S.W., round West, to North, but completely sheltered from all other winds. To reach the best anchorage, bring the West end of *Ajima* or *Assinia Island* to bear North, and then steer North until the mouth of Mikuni River (which is easily distinguished) bears E.S.E., when 7 fathoms will be found; bottom sand and hard mud, good holding ground. The course can then be laid E.S.E., steering for the entrance, and, as the soundings decrease gradually, suitable water may be found for an anchorage. There is apparently deep water off the West side of Ajima.

The town of *Mikuni* or *Sakiura* is said to contain about 10,000 inhabitants, exporting silk and dried fish. It is situated on the right bank of the river, about half a mile from its mouth; the bar has only 6 ft. at low water, and the tide rises about 2 ft.

WAKASA BAY, an opening 25 miles wide, commences at 18 miles beyond Mikuni. At its S.E. angle is Tsuruga Bay, and in the S.W. angle is Myndsu, both visited by the *Shenandoah* in 1867. Some of the numerous inlets afford safe and sheltered anchorage.

TSURUGA BAY is a large inlet, which extends to within 10 miles of Biwa Lake with which it is connected by railway. Thence a line of steamers runs to Otsu at the southern end, the terminus of the railway from Kobé and Osaka. The American directions follow.

This harbour is very easy of ingress and egress, and, so far as is known, free from rocks. No soundings under 13 fathoms until you get well in the harbour;

the western shore should be avoided. During autumn and winter a heavy swell sets in when the wind is from the northward and westward. The land around is high.

LIGHTHOUSE.—On *Tate-ishi no hana*, the western point of the entrance, is a granite lighthouse, 18 ft. high, showing a *fixed bright* light, elevated 407 feet, and visible 20 miles seaward between S.W. by W. $\frac{1}{2}$ W. and S.E. $\frac{1}{2}$ S. Lat. $35^{\circ} 47' 30''$ N., long. $135^{\circ} 58'$ E.

The town of *Tsuruga*, at the head of the bay, contains about 15,000 inhabitants, and exports dried fish and rice. Good lime is made in the neighbourhood.

Approaching *Tsuruga Bay* from the northward, steer so as to be distant 6 miles from the North end of *Tama gawa* when it is brought in line with *Ibo Point*; then steer S.E. $\frac{1}{2}$ S. until a triangular white cliff, to the left of the town, is opened, when bring it to bear S. $\frac{1}{2}$ E., and then steer for it until the first prominent point on the eastern side of the bay is brought to bear E. by N. $\frac{1}{2}$ N.; then steer S. $\frac{1}{2}$ W. to the anchorage. The best anchorage is in *Joyo Bay*, N.W. of the town, in 9 or 10 fathoms. There is also less sheltered anchorage at about one-third of a mile from the shore, off the town. It is high water, on full and change, at $1^h 30^m$; springs rise 2 ft.

In *Wurasuga Bay*, a narrow inlet about 2 miles S.E. of the lighthouse, small vessels may anchor, perfectly sheltered.

Ohama Harbour, the entrance to which is in long. $135^{\circ} 44\frac{1}{2}'$ E., is $1\frac{1}{2}$ mile wide. It is an extensive sheltered sheet of water, 3 miles deep, and over 7 miles wide, the depths shoaling evenly to 3 fathoms half a mile off the town, on the East shore. The best anchorage is under the eastern entrance point, in 11 fathoms, or with the entrance of *Ohama River* bearing S.E. by S. $\frac{1}{2}$ S., distant 1 mile. A small *fixed bright light* is shown on the North side of the river entrance.

Sira saka, the next large inlet West of Ohama, is safe as far as at present known, but it has not been surveyed.

MIYADSU, in lat. $35^{\circ} 32'$ N., long. about $135^{\circ} 10'$ E., is a magnificent harbour, affording shelter for the largest vessels, and easy of ingress and egress. It is an inlet 5 miles in length, with an average width of over 1 mile, having deep water close along its shores. The depths shoal very gradually from 20 fathoms off the entrance to 8 and 10 fathoms, mud bottom, at its head, 2 or 3 cables off the town of Miyadsu. A mid-channel course will lead in clear of danger. The town contains about 12,000 inhabitants. Silk is manufactured in the neighbourhood, and this is a great mart for dried fish.

At 8 miles inside the entrance the western shore is formed by a narrow wooded spit of sand, which extends southward for $1\frac{1}{2}$ mile towards the high land North of the town, enclosing behind it a deep lagoon, but the entrance has only 6 ft. water in it. Spring tides only rise 1 foot.

Port Ine, $4\frac{1}{2}$ miles North of Miyadsu, is a well-sheltered little anchorage,

about half a mile across. *Asi sima*, a small island, lies at the entrance, and has deep water on both sides; the eastern channel is only about 100 yards wide, but the western one is $1\frac{1}{2}$ cable wide. There is anchorage, in 10 fathoms, about $1\frac{1}{2}$ cable from the western shore. The water on the eastern shore is inconveniently deep.

The land hereabout appears high, and of a uniform appearance. *Okino sima* are a good landmark; the southernmost bears N.E. $\frac{3}{4}$ E., distant about 8 miles from the entrance to Myadsu Harbour.

OKI ISLANDS consist of one large and a group of three smaller islands, separated by an open and apparently safe channel, with a number of islets and rocks, occupying an extent of 23 miles, N.E. and S.W.

Oki sima, the N.E. and largest island, about 10 miles in diameter, and 3,000 feet high, has some detached high rocks close to its cliffy northern point. Its S.W. extreme terminates in a high steep bluff, but its S.E. point is comparatively low. No sign of tolerable anchorage was observed all along its western shore. *Saigo Harbour*, on its S.E. side, affords excellent shelter. The entrance, only $1\frac{1}{2}$ cable wide, is quite free from danger, and inside it the harbour opens into two inlets, the northern one having depths of 20 to 14 fathoms. The western inlet can only be entered by very small vessels.

The group of three islands is about 9 miles in diameter, and probably good anchorage may be found, as there are deeply-indented bays. The North point of *Nisi sima*, the westernmost, rises to a sharp peak 1,700 ft. high. The other two are about half that height. They appear to be thickly populated, and the hills are cultivated to their summits.

Miku ura, in long. $133^{\circ} 20'$, affords excellent anchorage in 9 fathoms, mud, sheltered from all but easterly winds.

Mino sima is in lat. $34^{\circ} 45\frac{1}{2}'$ N., long. $131^{\circ} 7'$ E., and 20 miles distant from the northern coast of the province of Nagato, which forms the foot of Nipon. Its highest part, elevated 492 ft., is in the centre of its West side. Its sides appear steep and cliffy, except on the N.E., where there is a sandy bay. A large square rock lies half a cable off its eastern point, and there is an islet on its N.W. side.

Taka yama, or *Cape Louisa*, 24 miles E. by S. $\frac{3}{4}$ S. from Mino sima, is a remarkable sharp peak, 1,680 ft. high, with a lower peak on its N.E. slope, and an islet off its North point. *Aston Rocks*, two in number, lie nearly $1\frac{1}{2}$ mile off it.

NATSUNGU SAKI, or **Square Rock Point**, is the northern extremity of the western prolongation of the toe of Nipon; it is 34 miles W. by S. $\frac{3}{4}$ S. from Taka yama, and 30 miles northward of the western entrance of the Inland Sea. It appeared to be about 700 ft. high, with a nipped outline, bordered by high cliffs on the North, and slightly tapering towards the sea, where it was about 500 ft. in height. It may be easily known by the remarkable square rock or head springing from its base, and which, being entirely detached from

the high land of the point, gives it the appearance of an island. Seen at the distance of 24 miles from the N.E., it assumes the appearance of gently-shelving table-land, having three or four large notches, the sharp cone of Aoumi sima and the distant summit of Kabuto yama showing to the eastward. The former, a sharp and remarkable cone 700 ft. high, marks the eastern point of the deep bay of Fukugawa.

Ai sima, or Richards Island.—Between Natsungu saki and Taka yama there is a large bay, with many islands in it, generally about 200 ft. high, and flat-topped, with cliffy inaccessible sides. The largest are Ai sima and O sima. *Ai sima*, the outer, is midway between the above capes and just within the chord of the bay; it is elevated 300 ft., having a flat-topped hill in its centre. *O sima*, 5 miles East of Ai sima, is 400 ft. high, but longer and flatter.

Haki or Hangi Bay.—The anchorage off the large town is bad, being open to the West, but good shelter may be found in 9 fathoms inside the North head, N.E. of the town.

Aoumi sima, $4\frac{1}{2}$ miles in length, East and West, is 10 miles East of Natsungu saki, its western point being the sharp cone before alluded to. On the Japanese chart there is represented between this island and the coast, a finely-sheltered and capacious harbour called *Misumi*, accessible by a broad channel from the eastward, and by a narrow channel from Fukugama Bay.

Igama Bay is an inlet extending 7 miles in an easterly direction on the South side of Natsungu saki, shoaling gradually from 20 fathoms at its entrance to 5 and 7 fathoms about a mile from its head. Some islets and rocks extend half a mile westward of its North entrance point, *Funa se*, awash at high water, lying $4\frac{1}{2}$ cables South of it. In entering, keep in mid-channel, and do not approach the shores on either side within half a mile. *Aburatani Harbour*, at the N.W. corner of the bay, affords good sheltered anchorage in 5 to 10 fathoms, mud, off the village of O-ura, half a mile N.W. of Ye-no sima Islet. There is also good anchorage $1\frac{1}{2}$ cable North of the islet. It is high water, on full and change, at $10^h 25^m$; springs rise $3\frac{3}{4}$ ft., neaps 2 ft.

Tsu-no or Kado sima (*Double Wedge Island* of Richards), 1 mile westward of the South entrance point of Igama Bay, is connected with the shore by a shallow neck of sand, with a high islet midway between. It is $2\frac{1}{2}$ miles long, E.N.E. and W.S.W., and of very peculiar formation as seen from the North, being divided nearly equally into two very flat quoins, the points of the wedges being both to the westward, and their steep falls to the East. On the S.E. side is a village and pier, but foul ground exists hereabout. The North point is low and smooth, with rocky patches extending about half a mile off it.

LIGHTHOUSE.—On the N.W. point of Tsu-no sima is a granite tower, 100 feet high, showing a *flashing bright* light every 10 seconds, elevated 142 ft., and visible 18 miles seaward between S. $\frac{1}{4}$ E. and N.E. by E.

About $4\frac{1}{2}$ miles N.W. by N. $\frac{3}{4}$ N. from the lighthouse, and 9 miles E. $\frac{1}{4}$ N. from Square Rock Point, is the North end of a bank of broken shells, sand,

and stone, having here a depth of 16 fathoms. The bank is said to trend towards the lighthouse, and to be connected to the point on which it stands, and there may be less water on it than is known. In the winter, during N.W. gales, a heavy sea runs on it, and many junks have foundered there.

From Tsu-no sima the coast trends southward to the entrance of Simonoseki Strait (page 789), which is approached by a very even and gradually decreasing depth. The shore should be given a berth, as, where surveyed or seen, it was found to be very rocky.

THE WEST COAST OF KIUSIU.

KOTSU SIMA, or Colnett Island, lies in Korea Strait, nearly midway between Tsu sima and Simonoseki Strait. It is a mile wide at its broadest part; its sides are steep, with a high cliff at the N.E. point, and rises with slight irregularities to a central peak 800 ft. high. Four notched rocks or islets, 80 feet high, lie 4 cables S.E. by S. of the South point.

Oro no sima, or Obree Island, in lat. $33^{\circ} 52' N.$, long. $130^{\circ} 14' E.$, and 37 miles W. by S. of Siro sima, is a double-topped island, the southern and higher hill being 276 ft. high. It is about a mile in diameter, and steep-to, with a few wretched inhabitants. There appear to be no dangers between this island and Colnett, Iki, Tsu sima, and the entrance of the Inland Sea.

Kosime no oosima, or *Wilson Island*, and the coast thence eastward to Simonoseki Strait, is described on pages 789—790.

GENKAI NADA is the sea comprised between Iki Island, Oro no sima, Wilson Island, and the mainland. The numerous islands within it are generally safe of approach, and the western portion is singularly free from danger. Not so its eastern part, where lie three very dangerous tidal and sunken rocks. The soundings appear very even, 20 to 30 fathoms, except in the vicinity of these rocks; the bottom is generally sandy.

A steamer taking this route only effects a saving of 8 or 10 miles, but a sailing vessel proceeding to the southward would benefit considerably by keeping inshore in the Genkai Nada out of the north-easterly current, and taking advantage of the tides, which are pretty regular, by dropping a kedge when unable to make way. At night the light on Yebosi sima is a good guide. The flood streams meet off Hakosaki; at springs the velocity is $1\frac{1}{2}$ knot.

The Coast.—From Katsuri saki, southward of Wilson Island, the hills gradually increase in elevation to the double peaks over *Kanega saki*, eastward of Wilson Island, but high mountains are seen in the interior. Southward of *Katsura saki*, off which is a small islet with a single tree on it, the coast is moderately low and wooded, to Chi-a saki, and thence a low strip of sand-hills terminates in the North entrance to Hakosaki Bay. Ten fathoms should be the least water when nearing this part of the coast. The sharp double-peaked

North Pacific.

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hill *Tatchi yama*, 1,335 ft. high, overlooking the head of Hakosaki Bay, is conspicuous along this coast.

Ai sima, $8\frac{1}{2}$ miles S.S.W. of Wilson Island, is a table-land, 240 ft. high, with bluffs to seaward, on which was a single tree. The island is about 2 miles round, and steep-to, having a bay on its South side which would afford fair shelter to a vessel from almost all winds; the depth, however, is great, and anchorage in 10 fathoms is close to the shore. On the eastern end of the island is a hummock, which from a distance looks like an island. At $1\frac{1}{2}$ cable off the East point is an arched rock.

Kuri no kami, or *Swain Reef*, a dangerous cluster of rocks, is about 3 cables in extent, some of them always showing above water. It lies 5 miles N.W. by W. $\frac{1}{2}$ W. from Ai sima, and $11\frac{1}{2}$ miles E.S.E. of Oro no sima, and is the principal danger to navigation in this locality.

Nagamo or Ellis Reef, lying S.W. $\frac{1}{2}$ W., $8\frac{1}{2}$ miles, from Swain Reef, lies more out of the fairway of vessels making a direct course through the Genkai Nada. It bears E. $\frac{1}{2}$ N., 8 miles, from Yebosi sima, and W. by N., $3\frac{1}{2}$ miles, from Too-dai Rock off Genkai sima. It never quite uncovers, but in bad weather the heads of the rocks are seen. At three-quarters of a mile S.S.E. of the reef is a patch of rocky ground, with soundings of 4 to 10 fathoms.

Nooze or Dove Reef, which shows some round boulder-heads, is 3 miles S.W. by S. of Ellis Reef. It is $2\frac{1}{2}$ cables in extent, and may be passed at half a mile on the outside in 18 to 20 fathoms, fine sand.

YEBOSI SIMA, or *Cone Islet*, 25 miles S.W. by W. $\frac{3}{4}$ W. from Wilson Island, is situated in the centre of the southern portion of the Genkai Nada, and is a most useful guide to avoid the dangers above described. It is formed of basalt, extraordinarily contorted, and is 160 ft. high, and quite steep-to. The rocks between it and Iki sima are described hereafter (page 884).

LIGHTHOUSE.—On the summit of Yebosi sima is an octagonal white light-house, 57 ft. high, showing a *fixed bright* light, elevated 182 ft., and visible 20 miles. Lat. $33^{\circ} 41' 30''$ N., long. $129^{\circ} 58' 50''$ E.

HAKOSAKI BAY extends about 10 miles eastward, with a width of 3 miles. The entrance, between Genkai sima and Siga sima, is about 2 miles wide, a considerable sea rolling in with northerly winds. *Genkai sima*, or *Reed Island*, is a round-topped island, 723 ft. high, with a bank of 2 to 5 fathoms extending from its southern side, leaving a narrow channel of 5 to 7 fathoms between it and the land. Two small islets lie on the West end of this bank, and a rock lies to the S.E. of them. *Too-dai*, a nine-pin-shaped rock, lies $3\frac{1}{2}$ cables W.N.W. of the island. *Siga sima*, on the East side of the entrance, is a rocky island, $1\frac{1}{2}$ mile long, with a ridge of wooded hills, and a grassy peak 636 ft. high. A narrow sand-bank, uncovered at low water, connects its S.E. point with the shore. Dangerous rocks extend $8\frac{1}{2}$ cables W. by N. $\frac{1}{2}$ N. from its N.W. point.

The bay is divided into two parts by *Noko-no sima*, a long narrow wooded

island 454 ft. high. In the passage South of it the depth is only 3 fathoms, but northward of it there is 7 to 12 fathoms. The outer portion of the bay, with 8 to 11 fathoms in it, is protected from all westerly winds, and the inner bay is well protected by Noko-no sima, but the depth shoals to 5 and 4 fathoms soon after passing the island, and this anchorage is not recommended for vessels drawing over 15 ft.

The shores of the inner bay are low and sandy, and at its S.E. part is the large city of *Fukuoka* or *Hakata*, two rapid streams flowing through it into the bay. Cultivated plains surround the city, and South of it the country is mountainous, rising 2,000 to 3,000 ft.

Light.—Near the North end of the city is a white lighthouse, 36 ft. high, showing a *fixed bright* light, elevated 40 ft., and visible 10 miles.

From *Nisi-ura saki*, the West point of Hakosaki Bay, the face of a hilly promontory trends 8 miles S.W. by W. to *Keya saki*, the indentations between affording no anchorage. *Keya saki* is a bluff cape, but southward of it rocky reefs extend nearly a mile off shore. At $1\frac{1}{2}$ mile westward of it is *Hime sima*, or *Hill Island*, with a bank of sand and gravel, uncovering at low water, extending 8 cables South of it. The island is wooded, about half a mile in diameter, and 647 ft. high.

Karatsu-no ura is a large indentation south-westward of *Keya saki*. The hill-ranges inland are extremely bold, *Uki take Peak*, with a small square top, rising to a height of 2,685 ft. Close to the West side of the entrance is *Kasira sima*, 281 ft. high, and about $2\frac{1}{2}$ miles southward of it are *Oô sima* and *Taka sima*, lying off the town of *Karatsu*, where a considerable trade is carried on by junks, which load with coal, brought from the mines about 6 miles distance up the *River Matsura*. There are also extensive porcelain manufactories at *Karatsu*.

The depths shoal evenly from 18 fathoms at the entrance to 5 fathoms, sandy bottom, at $1\frac{1}{2}$ mile off the town, where there is good shelter, except from N.W. to N.E. winds, when the bay of *Funa-goshi*, at its East end, offers the best shelter.

IKI SIMA, the largest island off the N.W. coast of Kiusiu, is 10 miles long, North and South, and 6 miles in average breadth. It is of sandstone and basaltic formation, chiefly table-land, the southern part rising to an elevation of 696 ft., and its N.E. hill about 500 ft. There are many islands and reefs off its shores, the deep indentations of which afford anchorage in well sheltered harbours. Reefs were seen to extend a considerable distance off the eastern coast.

Go no ura, on the S.W. coast, has depths of from 12 to 20 fathoms, but near the centre is a rock, covering at high water. It affords shelter from almost any wind. In bad weather, from the North or West, *Go no ura* is convenient and safe. To enter it from the westward, steer for the South point of *Ihira sima*, the outer or southern island, giving it a berth of 2 to 3 cables, then steer

E. by N. for the next low rocky islet, giving it a berth of half a mile, when haul up N. by E. $\frac{1}{2}$ E., anchoring near the head in 12 fathoms. The telegraph cable between Yobuko and the Korea is landed here.

Kooze no ura, on the West side of Iki sima, is not recommended as an anchorage, on account of the swell. *Yu no ura*, on the N.W. coast, has several islets and rocks in it, and the navigation is difficult for a stranger.

Na sima, a cluster of rocks and islets, about $1\frac{1}{2}$ mile long, E.N.E. and W.S.W., lies about 3 miles off the East coast of Iki sima; the southern islet is flat-topped, and 60 ft. above the sea. *Idzumi Islets*, about 2 miles eastward of Na sima, consist of two low flat rocks, only 14 ft. above water, and probably more dangers exist between them. A rock, with only 8 ft. water on it, lies three-quarters of a mile S.S.W. from the eastern Idzumi Islet, and $3\frac{1}{2}$ miles N.W. by W. $\frac{1}{4}$ W. from Yebosi lighthouse.

Kagara sima, or *Christian Island*, is the centre and largest of three islands off the main land, $8\frac{1}{2}$ miles S.E. of Iki sima. It is $1\frac{1}{2}$ mile long, North and South, with a rock, drying 4 ft., at $2\frac{1}{2}$ cables off its South point. *Mats' sima* lies close off its S.W. part, a rock above water lying in the centre of the South end of the passage; and rocks extend 3 cables off its S.W. point. *Oögawa sima*, 1 mile eastward of Kagara, is about three-quarters of a mile in extent, with a clump of trees on its S.E. head, 245 ft. above the sea. The passage between is quite clear.

Hira sé, or *Passage Reef*, lies half a mile S.E. of Oögawa, and at its North and South ends are rocks, 20 and 30 ft. high, on which are fishing look-outs. It is $3\frac{1}{2}$ cables long, and the whole shows at low water; shoal water extends 3 cables from its South point. *Oö ri sé*, with only 3 ft. on it at low water, lies $2\frac{1}{2}$ cables from the northern rock.

YOBUKO HARBOUR, southward of Kagara sima, is formed by two deep sheltered indentations, faced by *Kabé* or *Kata sima*. Yobuko, a large fishing village, is on the eastern inlet, which is $7\frac{1}{2}$ cables deep, and $1\frac{1}{2}$ cable wide; whilst the western branch runs South for $1\frac{1}{2}$ mile, varying in breadth from 1 to 2 cables, with deep water, and the large village of Nacoya on its western side. *Hato saki*, the western point, is low and rocky, with a remarkable square clump of trees on it. *Kabé sima* is $1\frac{1}{2}$ mile long, with a clump of trees on the southern end, 412 ft. above the sea.

The western entrance is broad, bold, and deep; the eastern entrance, which is used by junks, being narrower. Westward of Yobuko Inlet a reef extends from the shore, leaving only a very narrow passage between it and *Kabé sima*.

Taka sima, off the eastern entrance, is a steep wooded islet, 209 ft. high, and at half a mile N.W. of it is *Mé se Rock*, 20 ft. high. A *Telegraph Cable* to Chusan Harbour, in the Korea, leaving the coast here, passes eastward of Taka sima and Mé se, and then between Kagara and Oögawa; it is landed at the S.W. end of Iki sima, and at the island of Tsu sima.

Light.—On the North end of Taka sima is a square tower, 15 ft. high,

showing a *fixed* light, elevated 156 ft., and visible 8 miles. The light is *green* over Mé se between N.W. by W. $\frac{1}{2}$ W. and N.W. by N., and *red* over Hira se between North and N.E. by N. $\frac{1}{2}$ N.; in other directions it shows *bright*.

To enter the eastern channel, keep a mid-channel course, and anchor in 14 to 12 fathoms. A long vessel should anchor in 10 or 12 fathoms in the western inlet, due South of the tuft of trees on Kabé sima. It is high water, on full and change, at 9^h 16^m; springs rise 9 ft., neaps 6 $\frac{1}{2}$ ft.

The coast southward of Hato saki is much indented, with long rocky points extending from the shore into deep water.

Madara sima, or *Covey Island*, 3 $\frac{1}{2}$ miles W. by N. $\frac{1}{2}$ N. from Hato saki, is 1 $\frac{1}{2}$ mile long, East and West, and steep-to. A rock lies 1 $\frac{1}{2}$ cable off its West point. The highest peak, 795 ft. high, is round and flat; the western peak, 659 ft. high, falls steeply to the sea over a cliff-bound shore. There is a village near the South point.

Futakami, 9 miles W. by N. from Madara, is a saddle-shaped island, about half a mile long, and 316 ft. high, with steep cliffs. *Ko Futakami*, a wedge-shaped rock, 176 ft. high, lies W. by N. $\frac{1}{2}$ N., 1 $\frac{1}{2}$ mile, from Futakami, and at 6 cables E.N.E. of this is *Kanatōo*, a small rock above water.

Kariya, the entrance to which is 4 miles S.S.W. of Hato saki, is a spacious and magnificent landlocked harbour, the depths varying from 17 fathoms at the entrance to 12 to 7 fathoms inside. It extends south-eastward for 1 $\frac{1}{2}$ mile, with an average width of three-quarters of a mile, with several islands in the South part. The village of Kariya stands on the North shore. To enter, keep about mid-channel.

Moko sima, 2 miles West of the entrance to Kariya, and 1 $\frac{1}{2}$ mile N.E. of Taka sima, shows bluff capes at each end. A ledge uncovers for 1 $\frac{1}{2}$ cable off its northern end, and 1 $\frac{1}{2}$ cable off the South point is a rock above water. A large rock also lies 6 $\frac{1}{2}$ cables S.S.E. of the South point, and from the latter a rock, just awash at high water, bears E.N.E., distant 5 cables.

IMARI GULF, the outer portion of which is protected by Taka sima and Awasi sima, has three channels leading into it. *Taka sima* is nearly 4 miles long, North and South, with rocks extending nearly to *Kuro sima*, which is 715 ft. high, with a cliffy face to seaward, 1 mile West of Taka sima.

The North channel, East of Taka sima, has tortuously-indented shores. The whole of the channel, as well as the spacious waters inside, almost form another harbour equal to Kariya, but at its southern entrance, and near its central part, it is encumbered by rocks and shoal patches.

The middle channel, between an island off the S.W. cape of Taka sima and a small island, 76 ft. high, 4 cables N.E. of Awasi sima, is 6 $\frac{1}{2}$ cables wide, but a shoal extends nearly 2 cables E.S.E. from the latter islet; and from the middle island shoal ground extends about 2 cables westward.

The South channel is 3 cables wide between Hosika saki and a remarkable clump of trees on a small island, connected with the South part of Awasi sima

by a sea-wall. In entering, keep rather close to the North side, which is steep-to.

Kanai saki is $5\frac{1}{2}$ miles E. by S. $\frac{1}{2}$ S. from the South channel, and the gulf carries depths of from 29 to 18 fathoms across. To the S.W. of this cape is a bay, with good anchorage on muddy bottom.

Fuku sima, half a mile eastward of *Kanai saki*, is a singularly shaped island. Between its N.E. coast and the main a narrow but deep passage leads to an extensive sheet of water, covered with innumerable islets and rocks, which, with a similar sheet of water South of it, has not been examined. There is excellent sheltered anchorage, in 5 fathoms, about 1 mile S. by E. from the S.W. point of *Fuku sima*; in 1874 coal could be obtained here at 3 dollars a ton.

From *Kanai saki* the gulf runs about S. by E., $3\frac{1}{2}$ miles, the middle depths decreasing from 17 to 3 fathoms, whence the water is shallow to the town of *Imari*.

Imari, at the head of the gulf, is small, but about 7 miles distant is *Arita*, where are the finest porcelain works in Japan. The population of *Imari*, in 1875, was said to be about 4,000. Coal is found in the neighbourhood.

Atsusi no O sima, $6\frac{1}{2}$ miles N.W. $\frac{1}{2}$ W. of *Awasi sima*, is $4\frac{1}{2}$ miles long, East and West, with two deep bays, on its N.E. and S.W. sides; that on the S.W. is the *Port Lindsay* of the old charts and *China Pilot*. The island is well cultivated; its highest hill, 720 ft., is near the northern end. Its coasts are bold, but half a mile off its N.W. side is a large rock named *Usé*, with several others around it, nearly $1\frac{1}{2}$ mile W. $\frac{1}{2}$ S. from the North point of the island.

Port Lindsay, on the South side of the island, is a large sheltered bay, but the water is too deep for convenient anchorage; the best is in 16 fathoms, at the N.E. end, and very small vessels could anchor in 5 fathoms in the small inlet at the head.

Do sima, 1 mile southward of *Atsusi no O sima*, is $2\frac{1}{2}$ miles long, and it has some rounded bare rocky summits of moderate elevation. At three-quarters of a mile off its southern side are some islets with rocky ledges, terminating in the small islet *Yoko sima*. Some sunken rocks lie 5 cables eastward of the East point.

Ikutski, or *Ykitsk Island*, $5\frac{1}{2}$ miles long, North and South, lies close off the N.W. point of *Hirado*, separated from it by *Obree Channel*. Its North point, off which is a rock, has overhanging cliffs of considerable height, facing the West, sloping gently to the East. The highest hill rises to a height of 929 ft.

Ikutski no seto, or *Obree Channel*, about 4 cables wide, is quite clear, with a depth of 9 to 15 fathoms in the middle; in passing through, keep nearer to the *Hirado* shore. The *Saracen* anchored just inside it in 7 fathoms, about 3 cables off *Tatchi* village, on the S.E. shore of *Ikutski*. At $1\frac{1}{2}$ mile N.E. $\frac{1}{2}$ E. of *Obree Channel* is *Nakai no sima*, about 2 cables long, with two small rocks off its North side.

HIRADO SIMA, or **Firando Island**, $17\frac{1}{2}$ miles in length, N.E. and S.W., and, owing to its deeply-indented coast-line, of an irregular breadth of 2 cables to $5\frac{1}{2}$ miles, lies adjacent to the West coast of Kiusiu, from which it is separated by Hirado no seto or Spex Strait. It is high and hilly, and much wooded, and its coasts are generally bold. *Yasman Take*, the highest hill, rises to a height of 1,792 ft. Over *Sisiki saki*, the bold South point, rises precipitously a remarkably sharp peak, 1,163 ft. high. *Tsuba saki*, the North point, is bold.

Yebukuro no minato, or *Port Firando*, forms two deep harbours, on the western side of the North end of Hirado, and was, previous to 1623, the chief location of British and other foreign trade with Japan, which from that period was restricted to the Dutch and confined to Nagasaki. The town is on the East side of the island. *Oosuka*, the northern harbour, extends 2 miles eastward, averaging half a mile in breadth, and is sheltered from all winds, the depths varying from 18 to 8 fathoms, muddy bottom. A good guide to recognise its position is the small island lying off the North point of entrance. *Kaji-kake*, nearly awash at low water, lies in mid-channel, about 7 cables inside the entrance, and can be avoided by keeping near the shore on either side. There is anchorage between Hirado sima and the head of the bay, in 12 and 13 fathoms, passing between this islet and another islet half a mile to W.S.W.

Ferugé, the southern harbour, about half a mile within the entrance, extends South, $1\frac{1}{2}$ mile, with a breadth of $3\frac{1}{2}$ to 7 cables, and is a perfectly landlocked harbour, with excellent holding ground everywhere. Its entrance, although barely $1\frac{1}{2}$ cable wide, is easy and clear, and the longest ship could boldly pass through it, and anchor as convenient in 10 to 15 fathoms, mud. A stream flows into the head of the bay, and there are some small villages on its shores.

Sisiki Bay, at the southern end of Hirado, is 3 miles deep, and has a general width of 1 mile, the depth gradually decreasing from 17 fathoms at its entrance to 5 fathoms near its head. *Ob Azika* and *Ko Azika sima*, two remarkably bold, rocky, conical islets, lie off the entrance.

The bay is open to the N.W. and W.N.W., but affords perfect protection from all other winds, and to any vessel well found in ground tackle it would be a welcome haven from a heavy westerly gale, as from 5 to 4 fathoms can be obtained near the head, where no very heavy sea could reach. Several islets lie off the West side of the peninsula forming the bay. A heavy tide-rip is generally found off *Sisiki saki*.

The eastern shore of Hirado is clear and bold, and can be approached to within 2 or 3 cables without danger. Sheltered anchorage, in 4 to 5 fathoms, mud, can be obtained close off the village of Kigatsu in a snug little bay. At 4 miles farther North the spacious bay of *Kawatchi* opens, in which anchorage can be found as convenient.

The town of *Hirado*, $2\frac{1}{2}$ miles from the North cape, is built on the North side of a narrow bay; off the entrance is *Kuro ko sima*, $1\frac{1}{2}$ cable long, dividing

Spex Strait into two channels, the eastern of which is used by vessels passing through.

Taské Harbour, about 1 mile South of Tsuba saki, and protected by a rocky islet, is very small, but much resorted to by junks, and has 4 to 6 fathoms water. A small *fixed bright light* is shown occasionally on the North point.

From the northern entrance of Spex Strait the coast takes an E. by N. direction to *Kama la Harbour*, far preferable, as an anchorage, to Taské. A little farther eastward is the deep bay *Kubiki no ura*, sheltered from all westerly winds. At $2\frac{1}{2}$ miles from Kubiki is Hosika saki, the southern entrance point to Imari Gulf. Kamada Bay is protected by the island of *Yoko*, and can be entered by steering midway between the S.E. point of the island and the opposite shore in 8 fathoms; inside there is 5 to 7 fathoms.

HIRADO NO SETO, or **Spex Strait**, is now much used by steam-vessels. A sailing vessel cannot, however, be taken through in safety without a commanding breeze, blowing directly through the strait. At its northern part, for $1\frac{1}{2}$ mile, the whole breadth of the strait is only 3 cables, and the navigable channel in two places is only $1\frac{1}{2}$ cable wide. This is the dangerous part of the strait; the great strength of the tides over the uneven bottom, especially westward of Hirosé Rock, causing small whirlpools, rendering it indispensable that a ship should have good steerage way to ensure safety. After passing this, the strait takes a circuitous round, for nearly 2 miles, to the next narrow passage, formed between the projecting part of Hirado and the coast; passing this the channel opens, the eastern shore having many indentations fronted by numerous islands, reefs, and rocks.

Hirosé Rock, 20 ft. high, lies in the middle of the northern entrance to the strait. A bank of $4\frac{1}{2}$ fathoms extends $1\frac{1}{2}$ cable N.E. of its North end, and at $1\frac{1}{2}$ cable S.W. $\frac{1}{2}$ S. and S.E. by S. $\frac{3}{4}$ S., respectively, from it are *Vineta Bank* of $2\frac{1}{2}$ fathoms, and *Sylvia Rock*, the latter lying at the extremity of a shoal bank extending from the shore. These narrow the navigable channel to $1\frac{1}{2}$ cable.

Ootaske Rock, 5 ft. high, lies about $1\frac{1}{2}$ cable N. $\frac{1}{2}$ W. from *Red Cliff Point*, at the second narrows; a patch of 15 ft. lies 150 yards north-eastward of it, and one of 9 ft. half a cable West of it. *Kotaske Rock*, drying 6 ft., lies 1 cable N.W. by W. $\frac{1}{2}$ W. from Ootaske. *Asama Bank*, of $1\frac{1}{2}$ fathom, sand and shingle, lies in mid-channel, 9 cables S.W. by S. from Red Cliff Point.

James Rock, uncovering 2 ft. at low water, lies 7 cables off the eastern shore, about $2\frac{1}{2}$ miles N.E. $\frac{1}{2}$ N. from the northern Kariki Island. *Robinett Rock*, nearly awash at low water, but seldom breaking, lies $1\frac{1}{2}$ mile S.W. of James Rock. *Kareki Islets* have reefs extending a short distance off their South points. *Costa Rica Rock*, the southernmost danger in the strait, has only 2 ft. on it at low water, and lies $1\frac{1}{2}$ mile S.W. by S. from South Kareki; North Kareki open West of South Kareki, N.E. by E., leads westward of it.

Kuro sima, facing the southern entrance to Spex Strait, is $2\frac{1}{2}$ miles long,

East and West. At $2\frac{1}{2}$ cables off its western end, a conspicuous bold bluff, is a flat rock, only 4 ft. above high water. *Ho-age*, or *Sail Rock*, presenting from a distance the appearance of a boat under sail, lies $4\frac{1}{2}$ miles W. $\frac{3}{4}$ S. from the West end of Kuro sima.

Taka sima, $1\frac{1}{2}$ mile N.E. of Kuro sima, and between which vessels steer when taking the eastern route, is a very conspicuous landmark, having a temple near some trees cresting a square-topped hill.

Midzu sima and *Mi sima* are two islets about a mile North of Kuro sima. Midzu, the eastern, has a reef drying 3 cables S.E. by E. $\frac{1}{4}$ E. from its S.E. point. A reef also extends 2 cables W.N.W. of the N.W. point of Mi sima.

Tides.—It is high water at Taske, on full and change, at 9^h 44^m; springs rise $8\frac{1}{2}$ ft., neaps 5 ft. The flood sets to the North, the velocity of the tidal streams varying from 2 to 5 knots in the strait.

Directions.—In entering Spex Strait from the North, vessels of light draught use either passage, but the eastern passage, although much narrower, is by far the safest and most easy to navigate. The North end of Kuro-ko sima, off Hirado, kept midway between Hirosoé and the wooded head of Ushi-ga no kubi, a point about 2 cables South of Hirosoé, leads clear through the passage, passing the rock at little more than half a cable. From the wooded point the Kiusiu shore should be kept at a cable's distance while rounding to Red Cliff Point, and thence the same shore must be kept on board, distant 2 cables, until abreast Aosa saki, $1\frac{1}{2}$ mile S.S.W. of Red Cliff Point, when a S.W. by S. course can be shaped for the extreme South end of Hirado.

Directions from the southward will be given hereafter.

Yenoi sima, 9 miles S. by W. of Hirado sima, has numerous scattered islets, rocks, and reefs off its North, South, and West sides, rendering great caution necessary when approaching it. The island is $1\frac{1}{2}$ mile long, N.W. and S.E., rising towards the North end in two sharp hummocks, the highest 436 ft. above the sea. Hira sima, to the westward, will be described with the Goto Islands.

Saracen Reefs, a line of reefs and rocks, extend nearly 3 miles S. $\frac{3}{4}$ W. from the South point; *Minamize*, the highest and central rock, is 65 ft. in height. At 2 miles W. $\frac{1}{4}$ S. from the South point is another patch of rocks and reefs, the highest of which, *Kuro sima*, is 120 ft. above the sea; the outer patch, of $4\frac{1}{2}$ fathoms, lying half a mile S.W. of it. *Mize*, uncovering 4 ft., lies 9 cables N.E. of Kuro sima. *Iwoze*, 30 ft. high, lies N.W. by W., $1\frac{1}{2}$ mile, from the N.W. point of Yenoi sima, and about 1 mile to E.N.E. is *Kanagashira*, 64 ft. in height, with several other large rocks.

Caution.—The channel westward of Yenoi sima being bordered by many dangers, navigation in these waters is injudicious and hazardous. The tidal streams are very strong, and set right on to the islands and reefs.

Oo tate, $3\frac{1}{2}$ miles East of Yenoi sima, has two hummocks near its S.E. end,
North Pacific. 5 x

257 ft. high. It is 6 cables long, and 8 cables N.W. by N. from its western point are two islets, 20 ft. high. A rock, awash, has been reported to lie half a mile N. by E. $\frac{1}{2}$ E. from Oô tate. *Ko tate*, or the Bonnet, a small cone-shaped islet, with a low rock close to its South side, lies 1 mile S.E. of Oô tate, directly in the fairway between Nagasaki and Hirado sima.

Fuku she, a dangerous rock 4 ft. above low water, lies $4\frac{1}{2}$ miles N. $\frac{1}{2}$ W. from Ko tate, and $6\frac{1}{2}$ miles S.E. by S. $\frac{1}{2}$ S. from the South cape of Hirado sima, directly in the fairway. On it is a stone beacon surmounted by a hemisphere, 34 ft. high, painted in red and white bands.

At $4\frac{1}{2}$ miles East of Ko tate is *Mikoto sima*, with strong tide-races off its West point at spring tides. A narrow shallow channel, with a reef in its southern entrance, separates it from *Kaki no ura sima*, which has a deep inlet on its western side, affording inferior anchorage for small vessels.

Oo sima, connected with the latter island, has numerous islets and rocks between it and the coast, the navigable channel, close to the East side, being 4 cables wide. To use it the chart is necessary. There is excellent anchorage, in 5 to 6 fathoms, in *Otawa Bay*. At $1\frac{1}{2}$ mile N.W. of Oô sima is *Kata sima*, a wedge-shaped island 527 ft. high, with a small rock three-quarters of a cable southward of it. At three-quarters of a mile N.E. of Kata sima is *Gana she*, a patch of rocks about a mile in extent, and at half a mile farther to the N.E. is *Shira she*, a smaller patch, the N.E. rock being about 15 ft. high.

O MURA GULF.—The islands and rocks just described lie off the S.W. side of the entrance to this extensive gulf, rendering the navigation near and among them difficult and dangerous. The gulf has not yet been explored.

At $3\frac{3}{4}$ miles southward of Ottawa Bay is *Takabo*, a cone-shaped hill 743 ft. high, with a clump of trees on its summit. At $2\frac{3}{4}$ miles farther southward is *Mats' sima*, 2 miles long, rising to a flat-topped summit 708 ft. high. There are coal mines on the island. An islet lies 4 cables off its N.W. point, and from the North point islets and rocks extend $6\frac{1}{2}$ cables to N.W. by N. $\frac{1}{2}$ N. The whole of the channel between Mats' sima and the mainland is much encumbered with reefs and obstacles.

Hiki sima is a partially cultivated island, 250 ft. high, 9 miles long, East and West, with a remarkable cone-shaped rounded hummock at its S.E. extreme, connected with the main body of the island by a long strip of shore. A ledge of rocks extends 7 cables N.W. of the North side of the island. Rocks also extend off its East and West extremes. At 1 mile N.E. of it is *Ike sima*, a flat wooded island, with a salt lagoon at its North end.

Hako sima, a small round island, $1\frac{1}{2}$ mile S.E. of Ike sima, has off its West side the remarkable pinnacle rock *Tengo*, with an arch through it. *Kashé*, a square rock, 162 ft. high, lies $1\frac{1}{2}$ mile E. by S. $\frac{1}{2}$ S. from Hako sima.

From abreast Kashé the coast trends S.S.E. to Miye no ura, with bold points and sandy beaches, nearly all the points having off-lying rocks. An isolated

sunken rock lies 6 cables off shore, at $1\frac{1}{2}$ mile N.W. $\frac{1}{2}$ N. from the outer flat rock off the North point of Miye no ura (p. 898).

GOTO ISLANDS.—This mountainous chain of many islands, lying between the parallels of $32^{\circ} 34'$ and $33^{\circ} 20' N.$, is 50 miles in extent, N.E. and S.W., and from 5 to 20 miles in breadth. The chain consists of nine principal islands, all much indented, forming six channels. The following descriptions, mostly taken from the China Pilot, are compiled principally from the reports of the surveys by Commanders Aldrich and Pearce, H.M.S. *Sylvia*, 1876-9, together with those of Commanders Brooker and Bullock, 1866-9, and J. Richards, master, H.M.S. *Saracen*, 1855.

The winds in the channels between the islands can never be depended on. The duration of the tidal streams in the North part of the islands is nearly equal, the main direction of the flood being to the northward, and the ebb to the southward.

Uku sima, the northern island, is $4\frac{1}{2}$ miles in extent, East and West; in the centre are two peaks, the northern 842 ft. high. The shores are indented, with several small bights affording shelter for boats. **Kura no hana**, its northern point, is low, with dangers extending one-third of a mile northward. At night give this shore a wide berth. **Koshi no se**, a group of three small islets, lies 2 miles East of Kura no hana, the centre islet being 200 ft. high. A patch of sunken rocks lies about half a mile westward of Koshi no se.

Ojika seto or Kosaka Channel is the strait southward of Uku sima and **Tera sima**, the latter 120 ft. high, off the S.W. side of Uku sima. To the eastward of its entrance are the **Kuromo-se**, a cluster of rocks 50 ft. high, at $2\frac{1}{2}$ miles S.E. of Uku sima. **Ko no ura**, between Tera sima and Uku sima, has a bank of $4\frac{1}{2}$ to 5 fathoms; the best anchorage is in 10 fathoms, northward of this bank. Small supplies of fish, vegetables, &c., may be obtained from the villages. The harbour should be approached with Tera sima seen just open to the westward of Uku sima, bearing N.W. $\frac{1}{2}$ W.

The western entrance of the Ojika seto is only 9 cables wide between Tera sima and **No sima**, and neither side should be closely approached. **Ai-no-se**, 16 ft. high, lies in the centre of the strait, $1\frac{1}{2}$ mile N.E. by E. $\frac{1}{2}$ E. from No sima; and **Mu sima**, 254 ft. high, with shoal water extending a quarter of a mile S.E. of its eastern point, lies on the South side of the eastern entrance to the strait, at 3 miles eastward of No sima, and 1 mile southward of Uku sima.

Nosaki sima, 1,142 ft. high, is $3\frac{1}{2}$ miles long, North and South. The channel between it and Mu sima, half a mile to the northward, has several dangers in it. Between the South end of Nosaki sima and the North end of Nakadori is a narrow strait, clear of danger, the islets **Tanji** and **Shimomu** lying about $1\frac{1}{2}$ mile to the S.S.E. of it. **Nokubi Bay**, on the East side of Nosaki, affords sheltered anchorage from all but S.E. winds.

Ojika Island, $3\frac{1}{2}$ miles long, East and West, is separated from Nosaki sima

by a navigable channel three-quarters of a mile wide. *East Bay*, on the eastern shore of Ojika, is three-quarters of a mile deep, and nearly 7 cables wide at its entrance, the shore being fronted with shelving rocks covered at high water. From Tonosaki, the South entrance point, rocks extend 2 cables northward, and shallow water half a mile south-eastward. Kuzukuri, the North entrance point, has a rock at the extremity of the shelving rocks projecting from it. The depths in the bay are from 4 to 14 fathoms, the best anchorage being in about 8 fathoms, with the North point of Nosaki sima, in line with the rock off Kuzukuri Point, bearing E. by N. $\frac{1}{4}$ N.; and the South end of Nosaki sima, in line with Tan-ji Islet, S.E. by S. $\frac{1}{4}$ S. It is high water, on full and change, at 8^h 40^m; springs rise 10 $\frac{1}{2}$ ft., neaps 2 to 4 ft.

At 6 $\frac{1}{2}$ cables westward of the S.E. point of Ojika, and 2 cables off shore, is *Ko-guro sima*, 57 ft. high. Anchorage can be obtained nearly midway between it and the S.E. point of Ojika, in 7 $\frac{1}{2}$ fathoms, sand, with the South extremes of Ko-guro sima and Kuro sima in line, bearing W. by S. $\frac{1}{4}$ S., sheltered from northerly winds.

For 11 miles to the westward of Ojika there are many islets and rocks. The northern of these, named *Hoage* or *Arch Rock*, lies 4 $\frac{1}{2}$ miles West of Madara sima, off the West end of Ojika, and consists of two pinnacles, 167 and 120 ft. high. A *dangerous rock*, drying 5 ft. at low water, on which the sea generally breaks, lies 6 $\frac{1}{2}$ cables northward of Hoage, with the summit of Biriyo sima in line with the West extreme of Hoage, bearing S.W. $\frac{3}{4}$ S.

Shiro-se, 105 ft. high, 13 $\frac{1}{2}$ miles W. by S. from Ojika seto, is the westernmost islet in the northern portion of the Goto Islands. It is divided into two pinnacles, nearly the same height, and off it are several rocks.

Shaku shi, or *Hodge Rock*, awash at low water, lies 4 $\frac{1}{2}$ cables N. $\frac{1}{4}$ W. from Shiro-se. The North peak of Nosaki sima in line with Hoage, bearing East, leads 2 cables northward of it.

Korai-no-ze Rock, with 18 ft. water, lies 6 miles S.W. $\frac{3}{4}$ W. of Shaku shi, near the S.E. edge of a rocky bank, 1 $\frac{1}{2}$ mile long and 2 $\frac{1}{2}$ to 7 $\frac{1}{2}$ cables wide, with from 5 to 10 fathoms on it. The North point of Biriyo sima, in line with the North peak of Nosaki sima, bearing E. $\frac{3}{4}$ N., leads northward of it; and the South point of Hira sima, in line with the North peak of Nosaki sima, E. by N. $\frac{1}{4}$ N., leads southward of it.

NAKADORI SIMA is 21 $\frac{1}{2}$ miles long between Sawo saki the South extreme, and Tsua saki the North extreme. The coast-line is deeply indented with bays. *O-mitzu yama*, a flat peak 1,446 ft. high, 6 miles from its North end, is the summit.

Nama ura Bay, on the western side of Nakadori sima, immediately to the southward of O-mitzu yama, may be recognised by *Cone Rock*, 313 ft. high, which forms the South entrance point. It is 2 miles deep and half a mile wide, with an even depth of about 16 fathoms; shelving rocks extend 3 $\frac{1}{2}$ cables in a S.W. direction from the N.E. side of the entrance. The best anchorage for large

vessels is near the head, in 10 fathoms, $2\frac{1}{2}$ cables from the shore, with the peak of O sima just open eastward of Cono Rock, bearing N. by W. $\frac{1}{4}$ W., and Joss Point, N.E. *Tsubo gashi*, a rock 10 ft. high, lies $1\frac{1}{4}$ mile northward of the entrance.

Hira sima, $1\frac{1}{4}$ mile from the East extreme of Nakadori sima, and 4 miles westward of Yenoï sima (p. 889), is $2\frac{1}{2}$ miles long, and rises to a peak 663 ft. high. Its western side is steep-to, and its eastern side irregular, with a few off-lying dangers and islets. *Haidomari Bay*, on the N.E. side, is 6 cables deep, but is only suitable for junks. *Komoda Bay*, on the S.W. side of the island, affords protection to small vessels from North and easterly winds; vessels should anchor to the south-eastward of a small wooded islet, named *Kojima*, lying near the centre of the bay. There are some mines of inferior coal here. *Nanori* is a remarkable rock, 92 ft. high, surrounded by rocky ledges, 6 cables to the south-westward of Komo-no saki, the South point of Hira sima.

The channels on either side of Hira sima are navigable; that between Hira sima and Nakadori sima is clear of danger, but in the channel between Hira sima and Yenoï sima are the *Saracen Reefs* (p. 889), to the southward of Yenoï sima, and the foul ground to the south-westward of Kuro sima. The eastern shore of Hira sima is the clearer side of this channel. In the vicinity of Hira sima the streams run through the channels at the rate of 3 to 5 knots during springs, causing heavy overfalls.

Oto no se, or *Oldham Rock*, covered at high water springs, lies nearly $1\frac{1}{2}$ mile E. by N. from *Sawo saki*, the South extreme of Nakadori. An islet, 78 feet high, half a mile to the westward of *Sawo saki*, in line with it, bearing W. $\frac{1}{4}$ N., leads to the southward.

The channel between *Sawo saki* and *Kaba sima* to the S.W. is 3 miles wide, and, with the exception of some rocks close to its northern shore, is deep and clear of danger. On the S.W. side of Nakadori sima is *Wakamatsu sima*, 6 miles long, N.N.W. and S.S.E., the narrow and tortuous *Nakadori Channel* lying between; this channel is dangerous, if not impassable, for ships.

Takigawara seto, separating *Wakamatsu* from *Naru sima*, is clear of danger, and is about 4 cables wide in its narrowest part. In approaching from the westward, *Arafuku Island*, on the North side of its entrance, is conspicuous, presenting a reddish appearance with the sun on it. Anchorage may be obtained in *Takigawara ura*, eastward of the narrowest part. The tidal streams at springs attain a velocity of 5 to 6 knots, the flood setting to the north-westward. The tides meet off *Kibuta*, the small rock 131 ft. high, in the southern entrance, forming heavy tide-rips.

Naru sima is much indented by deep inlets, *Ai-no ura*, the western of two inlets on its North side, affording anchorage in 10 to 12 fathoms, sand, about three-quarters of a mile from the head. *Kadzura sima*, to the northward, has an extremely rocky coast, with a sandy beach and small village on its S.E. side.

Naru seto, or *Kuga Channel*, separates Naru sima from Hisaka sima; it is about 5 miles in length, half a mile wide near its central part, and clear of danger. A good mark for the northern entrance is a hill, 637 ft. high, on the N.W. point of Naru sima, with a peculiar knob on its summit when seen from the westward. In the approaches from the southward are two dangerous rocks, with only 3 ft. on them at low water: *Gunn Rock* lies three-quarters of a mile S.S.W. from the South point of Naru sima, and nearly two-thirds of a mile S.E. by E. from the islet off the South end of Mia sima. *Keary Rock* lies $1\frac{1}{2}$ mile S.W. by W. $\frac{1}{4}$ W. from Gunn Rock, and $1\frac{1}{4}$ mile S.W. $\frac{3}{4}$ S. from the same islet. The tidal streams attain a rate of 6 knots at springs in Naru seto, and heavy tide-rips are met with.

Okushi Harbour, at the West end of Naru sima, and inside the Naru seto, is a well protected harbour, the best anchorage being in its centre, in 10 to 11 fathoms, sand. *Hardy Harbour*, a small inlet, 8 cables in length, North and South, and 1 to 3 cables broad, is a snug anchorage, on the S.W. side of Naru sima. On the S.E. side of its entrance is *Observatory Islet*, at 1 cable South of which a shoal, with 9 ft. water, extends $1\frac{1}{4}$ cable from the shore. From the N.W. side of the entrance a shoal of 2 to 5 fathoms extends southward half-way across the entrance, leaving a deep channel between a 12-ft. patch and *Observatory Island*, only 1 cable wide. The best anchorage is in 10 fathoms, $3\frac{1}{2}$ cables North of *Observatory Islet*.

Hisaka sima is 5 miles long, and $3\frac{1}{4}$ miles wide, hilly, and rocky along its shores. Its northern shore is indented by *Hisaka no minato*, a long inlet extending $2\frac{1}{4}$ miles to S.S.E. It has a narrow winding entrance, in some places only 1 cable wide, but clear of danger, and on emerging from this narrow passage a perfectly landlocked basin is reached. At the South end of this basin are two shelving muddy points, about 1 cable apart, with 7 and 8 fathoms between them, forming the entrance to an inner and smaller basin. Perfect security may be had here, and repairs and beaching could be effected with safety in any weather. No supplies can be obtained.

Tanno ura seto, or *Fukuye Channel*, between Hisaka sima and Fukai sima, is about 4 miles in length, with an average width of $1\frac{1}{4}$ mile. It is clear of danger, with the exception of some sunken rocks lying half a mile N.E. by N. $\frac{1}{4}$ N. and W. by N. from the northern point of *Tatara sima* at its eastern entrance. Vessels should pass between *Tatara* and *Yaneo*. A rock, 4 ft. above high water, lies three-quarters of a mile N.W. of the North point of *Fukai sima*. The tidal streams run very strongly, attaining a rate of fully 7 knots in the narrowest part of the channel. The flood tide sets to the northward. Heavy tide-rips occur off the North end of the channel.

FUKAI SIMA, the principal island of the Goto group, is about 18 miles long, N.E. and S.W., and 15 miles across. It is very hilly, and its shores are broken by numerous inlets and bays. The highest and most prominent peak on the island is *Tetega yama*, 1,520 ft. high, near its western side. *Kashi no ura*, on

the East side of the southern entrance of Tanno ura seto, has a small islet in its entrance, the channel, $1\frac{1}{2}$ cable wide, being on its West side. Inside there is anchorage in 11 fathoms, mud.

FUKAI, the chief town of the Goto Islands, is built on the sloping shore of an open roadstead, southward of Tanno ura seto. It presents a thriving and cleanly appearance, and behind it are fertile and well cultivated hills. There is a junk harbour formed by a camber, with a small lighthouse at its extreme.

Immediately South of the main portion of the town there are reefs with large boulders on them, which dry 3 ft. at low water spring tides.

Fowls, fish, and vegetables may be procured. A small steamer runs about once a fortnight between Nagasaki, Fukai, and the Korea. The most convenient anchorage is with the summit of *Sada sima*, 467 ft. high, bearing E. $\frac{1}{2}$ N., and the East extreme of Yanco, in line with the summit of Tataru, N.N.E., in 8 to 9 fathoms, at $4\frac{1}{2}$ cables from the lighthouse.

Sakai yama hana, the eastern point of Fukai sima, rises to a cluster of grassy conical hills, 470 ft. high. *Tatai sima*, a conical rock, 191 ft. high, 1 mile to S.E. $\frac{1}{2}$ E., is at the S.W. end of a group of islets and reefs extending thence, nearly half a mile, to N.N.W., and $1\frac{1}{2}$ mile to the eastward. Tataru summit in line with the East extreme of Sada sima, N.W. by N. $\frac{3}{4}$ N., leads eastward of these dangers.

Tomie minato, or *Tawo Bay*, indenting the S.E. side of Fukai sima, is about 2 miles wide at its entrance, and about the same in depth; but shoal water, extending from its South shore, contracts the anchorage considerably. In its S.W. part are several low islets and rocks, off *Tomie* village, where fowls, fish, and vegetables may be procured. Very good anchorage may be obtained in Tomie minato, sheltered, except from between E.N.E. and S.E. by E. In entering, the southern shore should be avoided. The island of *Kuro*, in the entrance, may be passed within a few cables on either side. Pass southward of Ko Shirashi, the white rock lying $1\frac{1}{2}$ cable S.S.W. from the rocky islet O Shirashi in the middle of the bay, and do not haul to the S.W. until midway between the rocks and the shore, when anchorage may be taken up in 6 or 7 fathoms, sand. *Mutsu*, two small rocky islets, lie off the northern channel into the bay, at 4 miles E. by S. $\frac{1}{2}$ S. from Ko Shirashi.

A group of islands, extending $3\frac{1}{2}$ miles N.E. and S.W., lies 5 miles S.E. by E. from Tomie minato. *O sima*, the southern and highest island of the group, is also the largest, rising to a height of 301 ft.; at its N.E. end is a fishing village. *Itabe*, about 1 mile North of O sima, is low and flat, with a depth of $3\frac{1}{2}$ fathoms in the channel between. *Aka sima*, 172 ft. high, lies about half a mile E.N.E. from Itabe; reefs extend from its North, N.E., and S.E. sides, *Hana se*, the northern reef, lying nearly half a mile from the island.

Tsubashi hana, the South point of Fukai sima, is the South point of a promontory similar to that at the N.W. point of the island; it rises gently to a height of 192 ft., and its shores are extremely shelving and rocky.

At $2\frac{1}{2}$ miles W. by N. is *Tsutara sima*, a narrow island, 364 ft. high, with reefs and rocks around it, extending nearly three-quarters of a mile S.E. $\frac{1}{2}$ E from its East end. To the North of this island is a large bay, 4 miles in length and 1 mile in depth, in the centre of which, and to the N.W. of *Tsutara*, are *Futago Islet*, 156 ft. high, and *Toma se*, a rocky reef extending nearly a mile S.S.W. from the shore, with an islet near its centre. At the eastern end of the bay is *Kuroshi*, affording excellent shelter from northerly and easterly winds.

Otakara Point, the West point of the bay, rises to a height of 330 ft., and at $1\frac{1}{2}$ cable S.E. of it is *Biro sima*, 221 ft. high, with a rock $1\frac{1}{2}$ cable S.S.W. of it. *Daiho mura*, the bay northward of *Otakara*, has a sandy beach near the village at its head, and affords sheltered anchorage from winds between West and N.E., in 8 to 10 fathoms, sand and shells. From *Otakara* the steep and rocky coast trends $3\frac{1}{2}$ miles W.N.W. to *Ose saki*.

OSE SAKI or Cape Goto, the S.W. point of *Fukuye sima*, is exceedingly bold, having 42 fathoms within $1\frac{1}{2}$ cable of it, its steep rocky shores receding from the cape at nearly a right angle. Immediately behind the cape is a wooded hill, 851 ft. high, and to the north-eastward rise three fine mountains (about N.N.W. of each other), separated by valleys. Very heavy overfalls are frequently experienced off this cape, even in calm weather.

LIGHTHOUSE.—On *Ose saki* is a white tower, 36 ft. high, showing a revolving bright light, attaining its greatest brilliancy every half minute, elevated 265 ft., and visible 22 miles seaward between North and S.E. by E. Lat. $32^{\circ} 36' 45''$ N., long. $128^{\circ} 36' 6''$ E.

Tama no ura, a large inlet or arm of the sea on the western side of *Fukai sima*, is finely situated as a port of refuge, and, but for its great depth of water, would be a magnificent harbour. Its entrance is $4\frac{1}{2}$ miles N.N.E. of *Ose saki*, and $2\frac{1}{2}$ miles S.E. of *Saga sima*, which is about 2 miles in length, and 512 ft. high. In the bay on the East side of *Saga* there is good anchorage in 7 to 9 fathoms, sand, sheltered from all westerly winds.

The entrance to *Tama no ura* is $6\frac{1}{2}$ cables wide, and must not be mistaken for a blind opening 2 cables wide, only $2\frac{1}{2}$ miles North of *Ose saki*, with a rocky reef across its entrance, and only available for boats.

The main inlet of the harbour, which has a varying breadth of 3 to 7 cables, follows the contour of the coast-line for 6 miles, separated from the sea by *Sima yama* and a belt of land extending a mile northward of *Ose saki*, the fishing village of *Tama no ura* being situated on the East side of the latter. It first runs S. by W., $3\frac{1}{2}$ miles, then curves to the S.E. for $1\frac{1}{2}$ mile to its head. The depth within the entrance is 32 to 38 fathoms, decreasing gradually to 16 fathoms at its head, rendering anchorage inconvenient.

Directly S.E. of the entrance, and on its eastern shore, the harbour branches into three narrow arms about a mile in length. Anchorage, sheltered from northerly and easterly winds, may be found on a sandy spit of 8 to 10 fathoms

projecting from the North shore of the harbour, just within the entrance, N.E. of Kojima or Hallows Island, which is 224 ft. high. With N.W. winds, however, this anchorage is exposed to a heavy swell, and the holding ground is not good. Off the village, at the inner part of the blind entrance, there is fair anchorage in 10 to 13 fathoms. Fish, fowls, vegetables, and good water may be obtained here. There is a good road from the village to the town of Fukai.

The best anchorage for large ships will be found at the S.E. part of the harbour, where the water shoals regularly. The best position is in 10 to 11 fathoms, sand and mud, at $2\frac{1}{2}$ cables from the shore. The entrance of *Nagasu no ura*, extending to the N.E. from the head of the harbour, is narrowed to 1 cable by Ko sima Rock, on its North side. Very safe and sheltered anchorage may be obtained here, for ships of moderate size, in 6 to 7 fathoms, mud.

It is high water at Tama no ura village, on full and change, at 8^h 31^m; springs rise 9 to 12 ft., neaps $1\frac{1}{2}$ to $4\frac{1}{2}$ ft.

The N.W. part of Fukai sima forms a projecting promontory, rising in its centre to *Sho yama*, 594 ft. high. Between this and *Kuro saki*, the N.E. point of Fukai sima, the coast forms a bay, the cultivated shores of which are much indented by three inlets. *Sho ura*, on the East side of the promontory, affords good shelter, except from winds between North and East, in 6 to 7 fathoms, about half a mile from its head. *Sonza ura*, the centre inlet, affords anchorage in 9 to 10 fathoms, mud, for a vessel of moderate size. *Kisiku no minato*, the eastern inlet, can only be used by very small vessels; good water, poultry, and fish may be procured from the village inside the entrance.

Hime sima, a mile N.N.W. of the N.W. point of Fukai sima, is 5 cables in length, and rises to a height of 647 ft.; *Oto no se*, 5 ft. above high water, lies midway between. *Kamisone*, two rocky knolls, the nearest of which lies $2\frac{1}{2}$ miles N. by W. $\frac{1}{4}$ W. from the West extreme of Hime sima, has $3\frac{1}{2}$ fathoms on it at low water; the outer knoll, $2\frac{1}{2}$ cables to N.W. by N., has only $2\frac{1}{2}$ fathoms on it. *Shinsone*, one-third of a mile northward of Kamisone Rocks, is a rocky patch of 4 fathoms. *Nechisone*, a 7-fathoms patch, lies $3\frac{3}{4}$ miles N.W. from the West extreme of Hime sima, and about 2 miles W. by S. from Kamisone Rocks. The locality is often marked by tide-rips.

Ose saki in line with the West extreme of Saga sima, bearing S. $\frac{1}{4}$ W., leads westward of all the above dangers. The point North of Sho ura, well open of the East extreme of Hime sima, leads to the eastward of them. The flood sets to the N.W. in this locality.

TORI SIMA, or **Pallas Rocks**, three in number, lie S.W. $\frac{1}{4}$ W., westerly, 33 miles, from Ose saki lighthouse, the southern and largest rock being 60 ft. high, and about one-third of a cable in length, in lat. $32^{\circ} 14' 36''$ N., long. $128^{\circ} 6' 18''$ E. The two southern rocks are close together; the North rock, 40 ft. high, lies 4 cables N.N.E. from the South rock. They are steep-to, and

North Pacific.

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fishing vessels, by hooking on to their lee side, ride out moderate breezes. Capt. Edmonds, of the P. and O. steamer *Orissa*, reports that on several occasions, when passing these rocks, the currents were found to be with the wind.

ME SIMA GROUP, or *Meac sima*, consisting of two principal and three smaller islands, with numerous islets, rocky pinnacles, and sunken rocks in the channels between them, lie between S.W. $\frac{1}{2}$ W. and S.W. $\frac{3}{4}$ S., 19 miles, from Pallas Rocks, the whole extending about 6 miles N.E. and S.W. They are visited by fishermen during the fishing season, May till November, a few only remaining during the winter. Strong tidal streams set through the channels between the islands, the flood to the N.W.

O sima, or *Taka sima*, the northern island, is nearly 2 miles long, and rises to a height of 752 ft. in a nearly flat ridge, covered with bushes, its bold rocky shores rising steeply for 250 ft. from the water. Off each point of the island lie detached rocks; none, however, more than $3\frac{1}{2}$ cables from the shore.

The South coast forms a bay 6 cables across, at the head of which stands a fishing village. Fair shelter may be obtained here, with winds from N.E. to N.W., in from 19 to 20 fathoms, hard coarse sand. At 2 cables off the S.W. point is *Kuromi sima*, a small island, $2\frac{1}{2}$ cables long, the tidal streams setting strongly through the channel between.

U'ri sima, the *Asses' Ears* of the old charts, at $1\frac{1}{2}$ cable S.W. of *Kuromi sima*, is 5 cables long, and 4 cables wide, rising in two rugged and sharp peaks, 570 and 607 ft. high respectively, the peculiar form of which gave rise to the name given them by early navigators. *Hanaguri sima*, $1\frac{1}{2}$ cable to S.W., is $3\frac{1}{2}$ cables long, and rises in rugged declivities to a height of 481 ft.

Me sima, the highest of the group, is nearly $1\frac{1}{2}$ mile long, and half a mile broad, its summit rising in a remarkably sharp peak, 931 ft. high, wooded on its western, but bare and precipitous on its eastern side. Its South point rises to a peak, 309 ft. high, and is almost separated from the rest of the island by a cleft in the rock. Near it is a fishing station and a pool of fresh water. Two rocky islets lie $2\frac{1}{2}$ cables off the South point.

Same no ut, the southern rock of the group, 18 ft. high, lies 11 cables S. by E. from the islets off the South point of *Me sima*, with deep water all round it.

THE BAY of NAGASAKI (long cape) is formed to the northward of a peninsula of the same name, between the headlands *Nomo saki* and *Oho saki*, which lie North and South of each other, distant 15 miles apart. The bay is fronted by a chain of islands and reefs quite sheltering the harbour, which is an arm or inlet at its head.

Miye no ura *Bay* of *Oho saki*, and about 5 miles N. by E. from *Iwo sima* light, is formed between *Nôze*, 3 cables off the North point, and *Kagura sima* on the South side. It has a shoal of $2\frac{1}{2}$ fathoms in the centre of the entrance. The depths are very uneven, but there is said to be good anchorage at the head

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of the bay, in 7 and 8 fathoms. It extends 2 miles in a N.E. direction, and is much encumbered with dangers. *Fukuda saki*, $3\frac{1}{4}$ miles S.E. $\frac{1}{2}$ S. from Kagura sima, is a bold headland, 680 ft. high, with *Teazer Rock*, with about 3 ft. on it at low water, lying 2 cables from its S.E. shore.

Iwo sima and Oki sima appear as one long island, although separated by a narrow boat-passage. They lie in a N.W. and S.E. direction, and are of undulating outline, the eastern summit of Iwo, the outer of the two, being 400 ft. in height. *Signal Head*, the N.W. point of Iwo, is a good guide for entering the bay. It is bold, and may be rounded at 3 cables distance, in 25 fathoms. On its summit, which is cleared of trees, there is a lighthouse and a signal-staff, from which the arrival of vessels is telegraphed to Nagasaki. Oki is more wooded than Iwo, especially its southern summit. There is access to Nagasaki Harbour by the channel East of Oki, between it and Koyaki.

The LIGHTHOUSE is situated on the end of a narrow ridge, 189 ft. high, $1\frac{1}{2}$ cable within the extremity of Signal Head. It is a white hexagonal iron tower, 35 ft. high, showing a *fixed bright* light, elevated 205 ft., and visible 21 miles, but eclipsed landward between E. $\frac{1}{2}$ S. and S.W. by S., outside Mitzuse Rocks. Lat. $32^{\circ} 43' N.$, long. $129^{\circ} 45' 13'' E.$

Hirase Rock, covering at high water only, lies 4 cables from the eastern shore of Iwo, and E. by S. $\frac{1}{2}$ S., 11 cables, from Signal Head; although not directly in the fairway, it is in the route of vessels beating in and out. There do not appear to be any other dangers near it. On it is a conical stone *beacon* bearing a ball, elevated 20 ft., and painted in red and white bands. The bluff of Papenburg Island, bearing E. $\frac{1}{2}$ S., leads 3 cables North of it.

Sotonohirase Rock, also covering at high water, lies 9 cables off the S.W. shore of Iwo, and S. by W. $\frac{1}{2}$ W., $1\frac{1}{2}$ mile, from Signal Head. It is steep to in 17 fathoms on the outside, but this depth is continued on a spit running 1 mile N.W. by W. from the rock, its outer part in 18 fathoms being W.S.W., $1\frac{1}{2}$ mile, from Signal Head, with 37 to 38 fathoms on all sides.

Kutsno se and Kuro se Rocks.—Kutsno se, 10 ft. above high water, lies inshore of the Sotonohirase, at $1\frac{1}{2}$ cable from Iwo. Kuro se is a large straggling reef, of which the southern and highest part is 15 ft. above high water. North and N.W. of it several reefs dry in parts on the foul rocky ground between it and the South end of Oki, from which it is distant 4 cables.

Taka sima, 3 miles S. by W. of Signal Head, is about 7 cables in extent, and has a precipitous ridge about 900 ft. high on its eastern side, and a smaller ridge over the cliffs on its western or sea-face. Its shores are very rugged, with reefs extending $1\frac{1}{2}$ cable off its North and West points. Three small islands, about 120 ft. high, *Tobi sima* to the North, and *Futako sima* (two islands) on the South, lie in line, North and South of its East face. The latter two are connected together, and fringed by reefs.

There are coal mines in operation on the East side of Taka sima, yielding coal of very fair quality; in 1883, the output amounted to 252,919 tons, valued

at about $3\frac{1}{2}$ dollars per ton. The only anchorage is on the West side of the island, in 2 to 7 fathoms, on a bank of coal and sand, which, at 3 cables from the shore, deepens suddenly to 15 and 20 fathoms. Small vessels might anchor there in fine weather and smooth water, but the anchorage cannot be recommended to large vessels requiring coal.

Hi sima and Nagano sima, $1\frac{1}{2}$ and 2 miles S. by W. and S.S.W. respectively from the summit of Taka sima, are smooth-topped islands, about 120 ft. in height, with rocky shores, reefs extending more than a cable off their southern points. Nagano sima is 4 cables S.W. of Hi sima, with about 14 or 16 fathoms in the passage between.

Mituse Rocks, the outermost dangers in the approach to Nagasaki from the South, lie $3\frac{1}{2}$ miles S.W. of Taka sima, and N.W. $\frac{1}{2}$ W., $2\frac{1}{2}$ miles, from the summit of Nomo saki. They spread irregularly over an extent of half a mile, the interior rocks of the group covering with the tide. On the northernmost rocks are two pointed islets, 60 ft. in height, with outlying patches on the East and West; the south-eastern of the group is a bare rock, about 6 ft. above high water.

NOMO SAKI, or **Cape Nomo**, is the S.W. extremity of the peninsula of Nagasaki. At a distance it has the appearance of an island, and, when nearing it, cannot be mistaken for any other land in its vicinity, though the mistaking of this cape for the South point of Kaba sima led to the wreck of the *Satsuma* steamer. From the West or S.W. the island Kaba sima will be seen off the low point East of the cape. At 6 cables North of the cape is *Nomo yama Point*, which rises steeply to the wooded summit of a prominent hill, Nomo yama, immediately beneath which, on a small bare shoulder towards the sea, stands a look-out house. The coast between is broken and rocky, and skirted with dangerous reefs, which dry out in patches to a quarter of a mile. At 2 cables off the cape is an inaccessible islet called *Nomo Rock*, surrounded by small, low, detached rocks, most of which cover.

Nomo ura, the entrance of which is 1 mile N.E. of Nomo yama Point, is a small and perfectly-sheltered harbour, 6 cables in length, and from 1 to 2 cables in breadth. Within, there is a depth of 5 fathoms, but it is only accessible to small vessels, having not more than 9 to 10 ft. at high water in the deepest part of its narrow entrance, which is only 100 yards across.

The West Coast of Nagasaki Peninsula, northward of Nomo yama Point, is bold, with a few outlying rocks, and may be passed at 2 or 3 cables, in 10 to 13 fathoms. To the N.E. of Nomo ura the coast is low as far as a hilly point 2 miles distant. Off it are several long reefs, drying out in patches. No part of this coast should be approached within half a mile.

The coast for 3 miles N.E. by N. of this hilly point is bold, with soundings of 5 to 9 fathoms near the shore. It lies under a succession of hill ranges, which terminate at a point abreast a group of rocky islets, North of which point the small bay of *Ooko mura* affords anchorage in 6 to 8 fathoms. A con-

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spicuous smooth-topped conical islet, South of the islet group, is very noticeable close off this coast.

Suzume, a bare rock, about 50 ft. high, is the north-western of this group of islets. *No sima*, the southern, and all the other islets, are wooded and low, and surrounded by large reefs.

Koyaki is the largest island off Nagasaki, and is situated directly S.W. of the entrance, which may be gained by the channels both East and West of it. This island is not high, but very hilly, its two chief elevations being 371 and 412 ft. Numerous reefs and islets border its broken outline, and on its eastern side there is a mass of reefs in the South channel.

An islet, named *Joka sima*, lies 5 cables W.S.W. of Mumenoki, the South point of Koyaki, and at 3 cables farther on is *Hadagase Rock*, probably united to Joka sima, as the large reef on which that islet stands stretches far towards the rock, as it also does towards Mumenoki. Hadagase may be passed at 4 cables on its West side, in 26 fathoms.

Kageno Island, about $3\frac{1}{2}$ cables in extent, and 218 ft. high, appears part of Koyaki, as it is only separated from its North point by a narrow boat-passage. *Naginato* or *Hungry Rock*, which covers at high water, lies a cable East of its N.E. point, off which is a small islet.

LIGHTHOUSE.—On the North point of Kageno is a stone lighthouse, 16 ft. high, showing a *fixed red* light, elevated 40 ft., and visible 8 miles between W. by N. and S.E. $\frac{1}{2}$ E., through North.

Kamino sima, at 6 cables North of Kageno, is the largest island on the northern side of the fairway to Nagasaki. Its North hill is elevated 330 ft., and on its central hill, which is lower, is a signal-staff. On the East side there is a small boat camber; on the S.W. the small flat island of *Siro sima*, on which there is a battery, connected with a work on Kamino sima by a causeway of masonry.

North-westward of Siro sima are the two small islands *Aino sima* and *Mats sima*. *Aino sima*, $1\frac{1}{2}$ cable distant, is a flat table island, about 60 ft. high, on a reef, with a conspicuous rock* close off its South point; *Mats sima*, 5 cables N.N.W. of Siro sima, is a small hill 100 ft. high. There is deep water in the passage between Siro sima and Aino sima.

Barracouta Rock.—Off Kabuto saki, the S.E. point of Kamino sima, on which there is a battery, are some small islets. At 1 cable from these, S.W. of Tree Rock, and W. by N. of the South bluff of Papenburg, is the *Barracouta*, a sunken rock, which may be cleared to the southward by keeping the summit of the coast range (800 ft.) over Megami Point open of Papenburg, bearing East.

Papenburg, or *Takaboko*, 2 cables S.E. of Kamino sima, is the small pre-

* This rock or islet was the observing place of Sir Edward Belcher, in 1842, from which several meridian distances were measured to Lu-chu, Quelpart, &c.

cipitous island covered with dark foliage, which so well marks the entrance to the harbour. It may be passed at half a cable, in 18 fathoms. In 1636 a massacre of Japanese Christians took place here, they being hurled over the cliff and dashed to pieces on the rocks beneath. At one-third of a mile to the N.E. of it is the small flat wooded island *Nezumi sima*,* lying off the small bay of *Kibatsu*, East of the large village of *Kosedo*. Foul ground extends about 3 cables S.E. of *Nezumi*.

Swinger Rock, discovered by H.M.S. *Swinger*, 1876, a dangerous sunken rock, about 8 ft. square, with only 4 ft. on it at low water, lies nearly midway between *Ogami Point* and *Papenburg Island*, and in the fairway of the entrance to *Nagasaki Harbour*. To clear it, keep *Signal Head* well open of *Kabuto saki fort*.

The **HARBOUR of NAGASAKI**, an arm or inlet running in a north-easterly direction from the head of *Nagasaki Bay*, is large and commodious, thoroughly sheltered from all winds, and available for ships of all classes. From its entrance, which is 3 cables wide between *Ogami Point* on the West and *Megami Point* on the East, it runs 2 miles N.E. by N. to the city, increasing to a breadth (although irregularly, owing to several bays on its shores), of three-quarters of a mile. Above the city it narrows again, taking a northerly direction for another mile to its head, which is exceedingly shallow. The depths decrease gradually from 16 fathoms at the entrance to 4 fathoms off the city. There is a battery on *Ogami Point*, and a temple stands on the South extreme. A sunken rock lies about 70 yards South of the East extreme.

Megami Point is at the foot of a steep ridge, on which are three batteries, one above the other. At $1\frac{1}{2}$ cable within it (a small islet lying between them) is another point, on the extreme of which, in a battery, was a remarkable large tree.

The harbour has three approaches. The principal one or fairway is directly from the N.W., the entrance of which, 4 miles outside the harbour, is between *Fukuda saki* and *Iwo sima*, and carries very deep water, 32 fathoms, decreasing to 20 fathoms in the passage between *Papenburg* and *Kageno*, and again to 15 and 16 fathoms at the entrance of the harbour.

The second approach is by *Oki Channel*, between *Oki sima* and *Koyaki*, but it is only 3 cables in breadth, and further narrowed by the reefs which extend into the channel $1\frac{1}{2}$ cable from either shore. There are irregular soundings of 7 to 19 fathoms in it, and the best course through is midway between the reefs which are seen. Neither this channel nor its approaches have been yet thoroughly examined.

The third approach is by the South channel, between *Koyaki* and the main, and can only be used by steam-vessels. Narrow and intricate amongst the

* The observing place of *Richards* in 1856, from which meridian distances were measured to *Hong Kong*, *Hakodate*, &c.

reefs, with soundings varying from 4 to 15 fathoms, it cannot be recommended, and can only be taken at the risk of the navigator.

Hishiwo Bank, which fronts the shore from Desima to the foreign settlement, is a good and convenient place for grounding. Its western edge is steep, but off Desima, W. by S. of the Dutch Consulate flagstaff, the bank is very flat. This is the anchorage recommended especially for gunboats and other small vessels.

The usual anchorage for men-of-war is just above the British Consulate Bluff, large ships anchoring in 6 to 7 fathoms rather over towards *Minage Point*,* at this the broadest part of the deep water of the harbour. Merchant vessels usually anchor off the foreign settlement in 4 to 6 fathoms, or even above Desima in 3 fathoms. In the hot weather of July and August, great relief may be experienced from the closeness of the atmosphere, and it will be beneficial to the health of the crews to spring the ship's broadside to the sea breeze, which, in fine weather, is almost constant from the S.W., and generally very fresh, until about the middle of August, when land and sea breezes occur. The best anchorage for holding ground and weather, clear of town, creeks, and drains, is with Owara Creek bearing S. 55° E., and Minage Point S. 50° W., in 6½ fathoms. The anchorage northward and inshore of the hulk moored off Owara Creek should be avoided, as the surface of the bottom is coated with about a foot of soft slimy mud, through which light anchors drag easily.

The **CITY of NAGASAKI**, a treaty port, at present second only in importance to Yokohama, and which was the only place of trade open to foreigners between 1623 and 1857, covers a broad valley on the eastern side of the harbour, surrounded by lofty hills. Its population amounts to about 40,000; there were 248 European residents in 1884. Nagasaki is one of the five imperial cities of Japan, and is under the jurisdiction of a governor holding his appointment from the Mikado.

Desima, the historic site of the Dutch factory, and artificially formed, projects into the harbour on the S.W. side of the city, to which it is only connected by a stone bridge. Shaped like the border of a fan, it is 250 yards in length, and 80 yards in width, and is traversed by a central street. Desima contained the residences and warehouses of the Dutch community, the Consulate being situated at its S.W. angle. At the broad steps at its West end is the best place for landing at the city.

The Chinese community, numbering 644 in 1884, occupy the square secluded block of houses S.E. of Desima, connected with the shore by a bridge. They compose a trading guild and factory.

The foreign settlement is on the flat South of Desima, having a water frontage of 730 yards; it also stretches up the valley on Owara Creek on the South.

* The rock on the South side of Minage Point, to which all the meridian distances are referred, is a convenient and quiet spot for taking observations.

The British Consulate is upon the bluff South of this creek, where there is a good landing-place. There are also two landing-places in front of the settlement, but only the lower one can be approached at low water. The American, French, and Portuguese Consulates are on the hills at the back of the settlement.

The Japanese Custom-house is situate directly East of Desima, but is not accessible to boats before a quarter-flood. The exports chiefly consist of coal, dried fish, rice, camphor, and tea, their value in 1883 amounting to £647,361. The imports are chiefly cotton, cotton goods, kerosene, sugar, and metals, their value in the same year amounting to £187,731. Of late years the imports have been much falling off in value, while the exports have largely increased. Munitions of war, by the 14th article of the treaty, can only be sold to the Japanese Government and to foreigners.

"Though Nagasaki is only third in the list of the open ports as regards the extent of its trade, it stands first as regards the numbers and tonnage of the shipping resorting to it. This apparent anomaly is due to its being the main source of the coal supply for the East of Asia. No less than 158 of the ships, of 75,226 tons, entered last year (1883), came here in ballast; and of that number only 15 went out either in ballast or with cargoes other than coal."—*Mr. Consul Hall.*

In 1883, 339 foreign vessels, with a total tonnage of 239,149, entered here, of which 211, with a tonnage of 145,705, were British. In the same year, 1,066 Japanese vessels entered, with a total tonnage of 410,462.

Dock.—There is a dry dock, 420 ft. long, with an entrance 89 ft. wide, and a depth of 27 ft. over the sill at high water, on the West side of the harbour, 1 mile South of the Arsenal. To avoid a bank extending $1\frac{1}{2}$ cable E.S.E. of its South side, the dock should be approached from northward of East. A ridge, with 24 ft. over it at high water, existed across the entrance, but this was being deepened to 27 ft. A red mooring *buoy* is moored in 34 ft., at low water springs, and a vessel 400 ft. long would just swing clear of the bank at half tide.

There is also a *Patent Slip*, 550 ft. long, capable of taking a vessel of 1,600 tons.

Time Signal.—A gun is fired at noon, local mean time, a red and white triangular flag being hoisted 5 minutes before.

Supplies.—All provisions are plentiful (mutton excepted), cheap, and easily obtained, as also is wood and water; the latter is brought off in boats to the shipping. Coal is abundant; there are several mines in the vicinity, the chief of which is in operation at Taka sima. There is a Japanese Government steam-factory and arsenal at Akunora, on the West side of the harbour, where there are facilities for repairing iron vessels.

The telegraph cable from Shanghai is landed on the peninsula of Senbon, after passing northward of Kageno sima and Iwo sima. Vessels are forbidden to anchor in its vicinity, its direction being marked by beacons on shore,

Pilots, either Japanese or European, can always be obtained. It is said that they are well acquainted with their business, and that it is their custom to take entire charge of the navigation of the ship; but great caution should be used in this respect, as some of them have only knowledge of particular localities.

Tides.—It is high water at Nagasaki, on full and change, at 7^h 15^m; springs rise 9 ft., neaps about 7½ ft., but they are variable. The current in the harbour is always sluggish. A strong southerly wind is said to raise the level of high water at springs to 2 ft. above the ordinary level.

DIRECTIONS.—The entrance of Nagasaki, although safe of approach, is sometimes difficult for a stranger to make out from a distance, especially in clear weather, when the islands blend with the mainland; but on nearer approach, or in slightly hazy weather when the islands appear in relief, the uncertainty is removed. It is said that vessels from the S.W. are very liable to make the entrance South of Iwo sima.

When making Nagasaki from S.W. or West, steer for the lighthouse and to round Signal Head, the North end of Iwo sima, at a quarter of a mile, taking care not to bring the light to bear northward of N.E. by N. (on which bearing it is obscured) on approaching it. By keeping the light in sight, or during the day keeping the North point of Iwo sima bearing eastward of N.E. by N., will clear the shoal water off the dangerous Soto no hirase Rock. After rounding the head, steer E. ½ S. for Papenburg Bluff, passing it as closely as convenient, but taking care to avoid Barracouta Rock; then E.N.E. for the entrance. At night do not bring Iwo sima light to bear northward of W. ¾ N.

Passing in mid-channel between Ogami and Megami Points, a N.E. course direct for the Dutch flag on Desima will then lead up in the best water, and when the factory of Akunora, on the West shore, opens of Minage Point, N. by W., a large vessel should haul up N.N.E., and anchor in 6 fathoms between it and the British Consulate or foreign settlement.

In approaching from the north-westward, the course from 1½ mile S.W. of Hike sima is S.E. by E. Iwo sima will be made without difficulty (appearing end on, and under the mountain range Kawareyama, the highest on the Nagasaki Peninsula), and passing about 1 mile northward of it Papenburg will be seen over the three low islands outside Kamino sima.

There is little or no difficulty in entering or leaving Nagasaki at night, if the weather be fine, as the light on Signal Head, Iwo sima, is visible 21 miles in clear weather, and the *red* light on Kageno sima now greatly facilitates night navigation; but should a vessel, from calms or adverse winds, be unable to enter, every endeavour should be made to get inside Papenburg if it be the intention to anchor, for outside this island the water is inconveniently deep, and it would be preferable to stand off and on till daylight, taking care not to decrease the soundings below 30 fathoms.

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Anchorage can, however, be found in 20 to 26 fathoms, over a bottom of thick green ooze with fine sand, good holding ground, or possibly rock or sand and shells if near Hirase Rock. A vessel will lie here sheltered from all winds except N.W., but exposed to the swell from that quarter. There is also anchorage East of Papenburg and Kageno, in 13 to 17 fathoms, or in 11 fathoms on a bank S.W. of Megami Point; the bottom here is mud, and the shelter good except from West. Towards the eastern shore the ground is irregular and probably rocky.

The East Coast of Nagasaki Peninsula.—About 22 miles of the eastern side of Nagasaki Peninsula has been surveyed. It has generally a bold steep coast, but there are several places on it where a vessel, blown to leeward of Nomo saki by West winds, will find anchorage and good shelter from them.

Kaba sima, 2 miles East of Nomo saki, is covered with steep hills about 400 feet high; its shores are mostly bold and abrupt, with rocks a cable off them. *Kabasima Bay*, between Nomo saki and Kaba sima, affords anchorage at its N.W. part only, open between S.E. and S.W., with reefs drying $1\frac{1}{2}$ cable off. The eastern part of the bay, where a long sandy beach is seen, should be avoided, there being a sunken rock, *Bay Rock*, with 6 ft. water on it, and 4 and 6 fathoms about it, lying $1\frac{1}{2}$ mile E. $\frac{1}{4}$ N. from Nomo Rock, and 1 mile N. $\frac{1}{4}$ W. of the West point of Kaba sima.

Misaki Bay, North of Kaba sima, and East of the low jutting point and sandy beach where stands the large village of Misaki, affords anchorage in 7 to 11 fathoms. It is gained from the westward by rounding, at not less than 2 cables distance, the South and S.E. points of Kaba sima, the latter a steep head, from which steer to pass outside a low reef (East Rocks) 1 mile N. by E. of that head, which being passed, steer N.W. $\frac{1}{2}$ W. into Misaki Bay, and anchor either in 10 fathoms East of the flat rocks (on which may be seen a large bamboo erection used by the fishermen, whose nets it will require care to avoid); or, passing North of the flat rocks, anchor in 7 or 8 fathoms. The channel North of Kaba sima has a depth of 6 to 17 fathoms, but is only a cable wide. Between East Rocks and Kaba sima the reefs leave only a narrow 4-fathoms channel. Fish is plentiful here.

Tameitsi Bay is $4\frac{1}{2}$ miles N.E. of Misaki. To enter it, steer for the village at its head, and when Kaba sima shuts in behind the southern point of the bay, anchor in 10 fathoms or less, about 2 cables off shore. *Sitziwura*, a small bay 2 miles farther N.E., has anchorage in 9 to 10 fathoms, at 2 cables off shore. Between Sitziwura and Mogi Bays, islets and reefs extend 2 or 3 cables from the shore.

Mogi, another small bay, is $5\frac{1}{2}$ miles N.E. of Tameitsi. Small craft can anchor in 3 to 6 fathoms, sheltered except from South to East; and larger vessels in 9 to 11 fathoms off the entrance.

Aba Bay, 3 miles N.E. of Mogi, and 15 miles from Kaba sima, is rectangular in shape, $1\frac{1}{4}$ mile deep, and 1 mile in breadth. There is anchorage in the

centre, in 7 fathoms, open only between South and S.E. There is a boat camber at the village on its western side. There is a road hence to Nagasaki, only 3 miles distant. *Maki sima*, on the East side of Aba Bay, encloses on the N.E. a harbour for small vessels, having 10 to 12 ft. water, accessible by two narrow passages.

SIMABARA GULF.—Of this large gulf, which extends 70 miles into the heart of Kiusiu, comparatively little is known. Simabara, a large and broad peninsula, so situated as to make this gulf an inland sea, has on its eastern shore a city of the same name. In the centre of the peninsula is an active volcano, *Uzen*, 5,000 ft. high, a dark cloud of smoke usually resting over its summit; to the eastward is a second summit rising at the back of the city. This is the focus of a wide volcanic region, and is associated with some of the severest earthquakes on record, one of which, in 1793, was felt throughout the whole of Kiusiu, and is said to have changed the configuration of the whole coast-line of the adjoining province of Higo, and the general form of its territory.

Haya saki Channel, the passage into Simabara Gulf, is about $2\frac{1}{2}$ miles wide. In its entrance is a rock uncovering 5 ft. at low water, reported by Captain Stevens, of the steam-ship *Filipino*. It bears N. 20° W. from the East extreme of Tsuji sima, on the South side of the entrance, and N. 64° W. from the East extreme of Oösima. Several other rocks are reported to lie southward of it. The tide runs with great velocity, producing whirlpools. On clearing the entrance, the flat-topped island *Yu sima* is seen ahead.

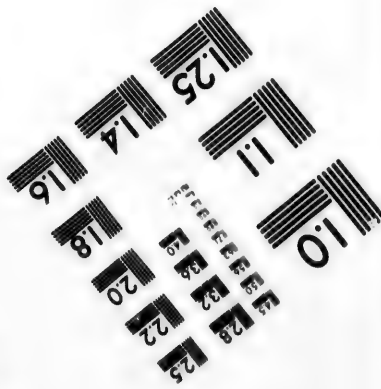
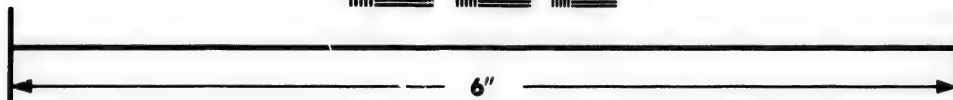
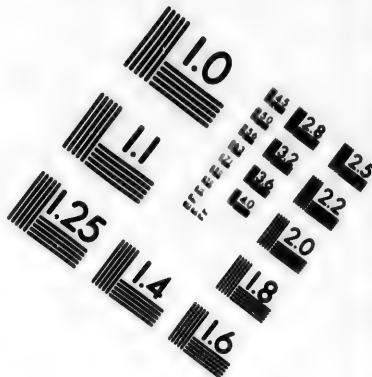
Kuchinotsu, or *Futsinotsu*, a junk harbour at the S.E. end of Simabara Peninsula, is the place of shipment for coal from the Muke mines, the output of which amounted to 142,340 tons in 1883. On its western entrance point is a white lighthouse, 16 ft. high, showing a *fixed bright light*, elevated 126 ft., and visible 8 miles seaward between North and W.S.W.

Simabara.—Abreast this town a bank of $3\frac{1}{2}$ fathoms extends at least half a mile from the shore, and there is probably no safe anchorage close to the town. Spring tides rise 14 ft. On a small island at the northern entrance to the anchorage is a white tower, 23 ft. high, showing a *fixed bright light*, elevated 35 feet, and visible about 6 miles.

The head of Simabara Gulf is shallow and full of dangers, and vessels navigating it should avoid the very turbulent "chow-chow" or disturbed water. *Tsikugo gawa*, a river at the head, is reported to have a depth of 12 ft. on the bar; *Saga*, a city famed for its porcelain ware, is situated westward of the entrance.

AMAKUSA, a large island 23 miles in length, lies $2\frac{1}{2}$ miles S.S.W. of Simabara Peninsula, and between them is the western entrance to the gulf. Two harbours, Tomioka and Sagitsu-no ura, on the western coast, afford shelter.

Tomioka, E. $\frac{1}{2}$ S., 14 miles, from the South point of Kaba sima, is a lagoon-like harbour, on the eastern side of a small peninsula, which forms the N.W.



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point of Amakusa. The harbour is formed by a low wooded tongue of land, curving round to the westward and enclosing it, giving complete shelter, the entrance being from the S.E. by a channel only 150 yards wide, carrying 5 fathoms water close along the South side of the low tongue. A vessel may anchor in the centre of the harbour, in 6 fathoms.

Sagitsu no ura, or *Kame ura*, 14 miles S. by W. of Tomioka, is a narrow inlet extending $4\frac{1}{2}$ miles eastward, the channel leading to its narrow entrance being rocky and uneven. Nearly 2 miles north-westward of the entrance are a low rock and two pinnacle rocks, forming good marks. A reef appears to extend N.N.E. from them towards Taka hama, a rock about 2 miles distant. The land around the harbour is high, and well cultivated. Supplies and water can be obtained at *Susinotsu*, the principal village; beef is moderately cheap. The head of the inlet is shoal.

On the South side, within the entrance, is *Kame ura*, almost closed by a bank of shingle. A shoal of less than 3 fathoms extends from its West point towards the North shore, and only 4 fathoms can be carried at low water between, and in passing through this narrow channel care must be taken to avoid a sunken rock off the North shore. In entering, after passing the North point, keep the northern shore on board until *Kame ura* opens out. Round the promontory facing *Kame ura* at half a cable until the channel leading to the inner anchorage opens, when anchor as convenient. The best anchorage is half a mile N.E. of the narrow pass, off *Mia-ga sima* Islet, in 7 to 10 fathoms, perfectly sheltered from all winds. It is high water, on full and change, at 8^h; springs rise 9 feet.

Koto no ura, South of *Sagitsu no ura*, has a series of detached reefs in its centre. *Kotame Bay*, on the South end of Amakusa, has a depth of 8 to 16 fathoms, and is well protected by *Kasu sima*. A reef lies in the centre. In rounding *Kasu sima* do not approach too near the S.E. rock, as reefs have been observed breaking outside it.

OTENTOSAMA SEA, between the western shore of Kiusiu and Amakusa and numerous other islands to the eastward, extends in a N.E. direction for 41 miles with an average breadth of 6 or 8 miles. It is studded with islets and rocks, and communicates by two channels with Simabara Gulf. The northern part is shoal, and blocked by sand-banks and rocks. *Naga sima* lies at the southern entrance to this spacious inland sea, leaving only narrow channels on either side. *Kuro no seto*, the southern entrance, is a safe and clear strait, but should only be passed at slack water, as the tides run with great velocity. The channel inside the Otentosama Sea, between *Sisi sima* and the islands to the westward, is foul.

At 17 miles southward of *Kuro no seto* is *Yoshiku misaki*, the western point of a mass of high land rising to a peak 1,694 ft. high. At 1 mile N.N.W. of it is *Kamo sima*, a small tower-like rock, 20 ft. high. The river *Sendai kawa*,

navigable for 20 miles by boats, enters the sea $3\frac{1}{2}$ miles northward of Yoshiku misaki; at its entrance is the large fishing village of *Gumisaki*.

At 3 miles S.S.E. of Yoshiku misaki is *Hashima saki*, $4\frac{1}{2}$ cables S.W. of which is *Okino sima*, a densely-wooded islet 301 ft. high. In the bight eastward of this point there is good anchorage in 7 fathoms off the village of Hashima, sheltered from northerly and westerly winds. At $4\frac{1}{2}$ miles south-eastward is *Nagasaki bana*, a rocky shelving point, with a dangerous reef extending over half a mile southward of it. From hence to the southward is a long stretch of sandy beach for 19 miles, backed by low hills. *Kinposan*, 2,100 feet high, with three summits, lies about 4 miles from the coast. Near the centre of this bight, and 5 miles off shore, is *Futa sima*, a bare rock, 126 ft. high.

Noma no hana, the most western part of Kiusiu, is clifly to seaward, and surrounded by detached rocks, mostly above water. *Kome jima* and *Hirase*, a group of islets and rocks, lies nearly three-quarters of a mile northward of it, with sunken rocks between. Hence the coast trends $3\frac{1}{2}$ miles eastward, forming rocky points, as far as *Kata ura*.

Kata ura is a small harbour, completely sheltered from all winds, and protected by two islets. The squalls are, however, violent, especially with westerly winds. Inside the bay is the village of *Kata*, and at its head is *Ko ura* village; fish, fowls, and occasionally a bullock may be obtained here. The entrance is somewhat difficult to make out, and, as foul ground extends for about two-thirds of a mile northward of the eastern entrance point, care should be taken to keep well over to the westward, until sufficiently close to make out the two small islets off the entrance, between which is the fairway in, $2\frac{1}{2}$ cables wide. A large ship will find the best anchorage in 12 fathoms, mud, abreast *Kata* village; a ship of moderate size may anchor farther in. Near the head of the harbour it is shoal for some distance from the shore. It is high water, on full and change, at $6^h 55^m$; springs rise 8 ft., neaps 2 to 3 ft.

From *Noma no hana* the rocky coast trends 6 miles S.S.E. to *Tsuruha saki*. *Noma no take*, a peak 1,964 ft. high, is conspicuous from seaward. *Beroe jima*, $3\frac{1}{2}$ miles S.E. $\frac{1}{2}$ S. from *Noma no hana*, is 8 cables long, and was covered with grass and stumps of dead trees. *She wan she*, a rock with less than 6 ft. water over it, lies 2 miles N.W. by W. from *Tsuruha saki*; the sea breaks heavily on it in bad weather. *Tsuruha saki* rises as an almost perpendicular cliff from a base of detached rocks extending $2\frac{1}{2}$ cables from it. *Sura take*, 816 ft. high, lies $1\frac{1}{2}$ mile inland from it. *Kushi ura*, to the southward, is very open and exposed, and of little use as an anchorage.

TOMARI URA, $9\frac{1}{2}$ miles South of *Noma no hana*, is a sheltered harbour, protected from all winds except those from West and S.W.; and from these quarters the sea is broken by a cluster of detached rocks stretching south-eastward from the North entrance point, *O she*, the southernmost rock, being 96 ft. high. At the head of the harbour is a village on a sandy beach, where

small quantities of fowls, fish, &c., may be procured. The coast hereabouts is rocky, and numerous detached rocks extend from 1 to 2½ cables off nearly all the prominent points.

Between O she Rock and a small rock, drying 1 foot, half a cable off the South entrance point, the entrance is 4 cables wide, and when within it the rocky islet, Matu sima, will be seen on the South side of the harbour; and the course may be altered to the eastward to pass it. Large ships should anchor in 11 fathoms, with O she open about three times its breadth northward of Matu sima. Vessels of moderate size will find better shelter by anchoring more to the southward in 9 to 10 fathoms, with the summit of Matu sima in line with O she. It is high water, on full and change, at 7^h 10^m; springs rise 8 ft., neaps 3 to 5 ft.

The situation and capabilities of Tomari ura render it an important harbour, especially as one of refuge to vessels experiencing signs of a typhoon in the neighbourhood of Van Diemen Strait. Indeed, it is the only secure harbour on the coast for 120 miles N.E. of Sata no misaki. In deciding to bear up for it when the weather showed unmistakable signs of a coming typhoon, it would be necessary to be sure of making it before thick weather came on.

Me saki, 1½ mile South of Tomara ura, is a cliffy point, with two sunken rocks 1 cable off it. Tide-rips are frequent westward of it, and between it and Okaimon daki patches of discoloured water will often be met with at 1 or 2 miles off shore.

Makura Bay, 3½ miles East of Me saki, is 2 miles wide, and on the sandy beach at its head stands the town of Makura. *Tatte se*, a pinnacle rock 145 feet high, lies 2 cables off the western point. Anchorage, sheltered from northerly and north-westerly winds, may be had off the town. The depths decrease regularly, with sandy bottom, but the West side shoals some distance from the shore.

From Shemmi hana, the East point of Makura Bay, the coast trends 4½ miles eastward to Akneshe hana, and thence 2 miles south-eastward to Okaimon daki (p. 783); it is fronted generally by a sandy beach.

Tides.—Between Noma no hana and Me saki the flood sets to the northward along the coast; the streams run 2½ to 3 knots an hour during springs, causing tide-rips off the prominent points. Between Me saki and the entrance to Kagosima Gulf, neither stream is very strong within 2 miles of the shore, enabling sailing ships to work along shore to the westward.

KOSHIKI ISLANDS, consisting of two large islands with numerous smaller islands, lies 12 miles off the mainland of Kiushiu, and extend 20 miles N.E. and S.W. They are very hilly, the highest peak, Oda yama, on the northern coast of the southern island, attaining an altitude of 2,036 ft. The inhabitants are poor and ill-clad, and are principally engaged in fishing and agriculture. This group was examined by Commander Aldrich, H.M.S. *Sylvia*, 1879, and the following description is taken from his report.

Shimo no Koshiki, the largest and southern island, is about 12 miles long, and 4 miles wide at its broadest part, the northern part tapering off to a narrow, rocky, and hilly promontory. *Teuchi ura*, on the South coast, affords shelter from all but southerly winds, in 8 fathoms, in about the centre of the bay, off a large village. Rocks extend off both points, the reef from the western entrance point narrowing the entrance to less than 5 cables. *Tsubura daki*, the N.W. point of the island, is clifty, rising abruptly to two sharp peaks about 530 ft. high. A rock, awash, lies nearly 2 cables West of it. To the southward the East coast is rocky and steep, for a distance of 5 miles, to Oda yama hana, southward of which are two open bays, with a village in each; near the southern village is a fine waterfall.

Imita no seto, the narrow channel separating *Shimo no Koshiki* from *Taira jima*, is navigable with due precautions; but the current runs 2 to 3 knots or more at springs, and overfalls form on either side. The passage is narrowed at one part to less than 2 cables by reefs which project from either shore.

Taira Jima, about 3 miles long, and connected to *Kami no Koshiki* by a reef, forms in two or three hills of over 900 ft. in height. Rocks extend nearly 5 cables off the S.E. point, amongst them being a conspicuous islet 175 ft. high, with trees on its summit.

Kami no (or Naka) Koshiki, the northern and most important island of the group, is of irregular formation, the S.W. coast being broken up by inlets and bays; the South coast is steep and clifty, and on the N.E. shore is a sandy beach enclosing a long narrow lagoon. A group of detached rocky islets, with several sunken rocks among them, extends 4 miles E.N.E. from the N.E. point, in the channels between which the rapid tidal streams cause tide-rips and overfalls. The ebb sets to the S.E., and it is then dangerous to approach them closely.

Nishi no ura, a deep bay on the North shore, affords shelter from all but North and N.W. winds. The water shoals gradually to the village at its head. *Sato ura*, a small bay on the East side of the island, affords no anchorage.

Tatsu Maru, on the S.W. side of the island, affords secured and sheltered anchorage. From the entrance the inlet extends northward for $1\frac{1}{2}$ mile, and is 4 to 5 cables wide; it then branches into two narrow arms. Large vessels should anchor about half a mile inside the entrance. Vessels of moderate size may anchor in 16 fathoms, abreast the opening to the eastern arm, and small vessels in 9 to 10 fathoms in the northern arm, abreast the village. The eastern arm is too narrow for anchorage, but a vessel could be safely beached at its head. It is high water, on full and change, at 7^h 40^m; springs rise $7\frac{1}{2}$ ft., neaps 3 to 5 feet.

Eastward of the South point of *Kami no Koshiki* the coast forms a double bight, in the eastern of which there is good anchorage. *Kamita hana*, separating these bays, is very rocky; and a reef, drying at low water, extends $2\frac{1}{2}$ cables from it.

Naka Koshiki ura, the western bay, extends three-quarters of a mile to the N.E., and at its head is the chief village of the group. Good anchorage may be obtained in 7 to 8 fathoms, sand, $4\frac{1}{2}$ cables from the village, and midway between the rocky and shelving shores. A few fish, fowls, eggs, &c., may be obtained.

Kuro Kami, a pinnacle rock 72 ft. high, lies 3 miles E. $\frac{1}{2}$ N. from the N.E. point of Kami no Koshiki, and between are several islets and rocks, the passages between which should not be attempted.

Naka no so, or *Pioneer Rocks*, discovered by H.M.S. *Pioneer*, in 1861, are two dangerous rocks, the highest, 8 ft. above high water, lying about $2\frac{1}{2}$ miles S.W. of Kuro kami. The channel between Kuro kami and Kamo sima, off the Kiusiu coast, is 9 miles wide, and in fine weather is perfectly safe. In thick weather, however, Naka no so is dangerous, and vessels should then keep to the eastward of it, where the depth is less than 30 fathoms, while westward of it the depth is 30 to 45 fathoms.

During August and September a constant southerly set was experienced in mid-channel between the Koshiki Islands and the coast, and allowance must be made for the westerly set which occurs on the ebb stream South of Hashima saki.

Taka sima, or the *Symplegades*, a group of five small islets, extending 2 cables East and West, and $1\frac{1}{2}$ cable wide, lies S. by E. $\frac{1}{2}$ E., $11\frac{1}{2}$ miles, from Na saki, the S.W. point of the Koshiki Islands. They were examined, with the groups to the S.W., by Lieut. Pearce, H.M.S. *Sylvia*, 1875. From the northward or southward they appear as three: the S.W. and highest, 210 ft. high, assumes a triangular shape; the S.E. islet, 189 ft. high, has a round summit; and the centre islet has the form of a pillar. The N.E. islet has two pinnacles. Two small rocks lie South of Taka sima; the eastern, 2 ft. above high water, lies S. $\frac{1}{2}$ E., nearly $4\frac{1}{2}$ cables, from the summit of Taka sima; the western rock, 4 ft. high, lies 2 cables S. $\frac{1}{2}$ W. from the same summit. A 15-ft. shoal lies 1 cable S.E. $\frac{1}{2}$ E. from the western rock. It is high water, on full and change, at about 7^h; springs rise about 9 ft. The ebb stream runs strongly to the south-eastward.

Tsukara so, or *Retribution Rocks*, were discovered by H.M.S. *Retribution*, in 1858. They lie S. $\frac{1}{2}$ W., $8\frac{1}{2}$ miles, from Taka sima, and consist of four rocks, divided into two groups by a channel nearly 1 cable wide. When bearing North or South they appear as two pinnacles, and when bearing East and West only three are visible. The southern rock is 96 ft. high, and the northern pinnacle 90 ft. high.

Udsi sima, or *Roche-Ponce Islands*,* lying 15 miles S.W. of Tsukara so, extend 5 miles N.E. by N. and S.W. by S., and consist of four islands, with

* Thus named (and deservedly so, if a European name is admissible), after the Ingénieur-hydrographe of the French Expedition under Admiral Cecille in 1846.

numerous rocks around them, the channels between the islands being navigable. The central and principal island is $1\frac{1}{2}$ mile long, with a conspicuous conical summit 1,097 ft. high. Off the N.W. point are several pinnacle rocks, among them being the Haycock, 330 ft. high. A conical islet, 190 ft. high, lies near the S.E. point. At 1 mile E. by S. $\frac{1}{2}$ S. from the S.W. point is a small rock covering at high water, and at three-quarters of a mile from the same point is another, 2 ft. above high water. *Double Island*, 8 cables West of the S.W. point, is 227 ft. high.

East Island, three-quarters of a mile eastward of Udsi sima, is 344 ft. high; the channel between is narrowed to about half a mile by off-lying dangerous rocks, and here fishing-boats find shelter. An islet, 132 ft. high, lies a short distance North of East Island, and a quarter of a mile from the East side are two rocks 12 ft. high; the eastern shore is cliffy, and fringed with off-lying rocks. *Sami sima*, or *Chimney Rock*, the southern rock, is 185 ft. high, and 2 cables long, lying S. by W. $\frac{1}{2}$ W., $2\frac{1}{2}$ miles, from the South extreme of Udsi sima; a small islet lies close to its North extreme.

DIRECTIONS from NAGASAKI to SIMONOSEKI STRAIT.—In passing through the archipelago which encircles the western coast of Kiusiu, there are not more islands than just sufficient as good marks in thick weather. Their coasts are generally bold; anchorages abound, and an offing may generally be made before nightfall, should that or the approach of thick or stormy weather render it desirable. The tides are regular within the islands. Outside, the N.E. stream is almost constant in the offing.

If proceeding *outside* Hirado, after leaving Nagasaki, steer N.W., unless wishing to pass outside Hiki sima. A run of 16 miles will place a ship abreast that island, and a further run of 13 miles on the same course will lead up mid-channel between Oô tate and Yenoï sima, from which position a N.N.W. course for 11 miles will reach the islets off the S.W. point of Hirado. Pass a mile outside these islets, and also of the Azika sima 3 miles North of them, unless intending to take the Obree Channel (p. 886), in which case pass inside them, and steer N.E. by N. directly for it.

Coasting Hirado and Ikutsi on a N.N.E. course, a run of $13\frac{1}{2}$ miles from Oô Azika sima will place a vessel off the North point of Ikutsi; then steer N.E. by E. for 7 miles until past Usé, the small rock off the N.W. face of Atsusi no O sima, which, if not seen, may be cleared by keeping the summit of Madara in line with the summit of Mats' sima, bearing E. $\frac{1}{2}$ N. Passing Usé at $1\frac{1}{2}$ mile distant, alter course to E. by N. $\frac{1}{2}$ N. to pass in mid-channel between Futakami and Madara, from whence at night Yebosi light should be

North Pacific.

sighted in clear weather; continue on the same course, passing about 1 mile westward of Yebosai sima. When that island or light bears S.E., alter course to N.E. by $1\frac{1}{2}$ E. to clear Kuri no kami or Swain Reef, and pass northward of Wilson Island, being careful lest the eastern tidal stream into the Strait of Simonoseki, which sets rather strongly through the channels East of Wilson Island, should set the vessel on to that reef.

By night, keeping Yebosai light bearing southward of S.W. by W. $\frac{1}{2}$ W., will lead fully $2\frac{1}{2}$ miles westward of Swain Reef; and the above course (N.E. by E. $\frac{1}{2}$ E.) continued on, should lead $1\frac{1}{2}$ mile westward of Kosime no Oösima.

THROUGH SPEX STRAIT.—The inner passage from Nagasaki to the Inland Sea by Spex or Hirado Strait is 15 miles less in distance than that outside Hirado, but it is seldom that a vessel is not obliged to anchor somewhere for the night.

The *coast route* is taken by vessels who know the land, and in thick weather prefer to sight it, and feel their way along from point to point. A more direct course, however, is to steer straight for Ko tate or Bonnet Rock, but allowance must be made for the current which, in the vicinity of Oö tate, and to the southward, sets N.W. and S.E.; so that a vessel in thick weather, and according to the state of the tide, may be set either to the westward and northward of her reckoning, or to the eastward, and towards the main. Having sighted the easily-distinguished Ko tate, the bold bluff at the West end of Kuro sima can be steered for, taking care to avoid that great danger, the Fukushe, marked by a beacon, and remembering also the low rock off the West end of Kuro sima.

After sighting the bluffs, vessels should steer for the South coast of Hirado, which can be boldly approached to 1 or 2 cables, and by keeping it in sight at 2 cables distance the Costa Rica and Robinett Rocks will be avoided. Vessels can run along the East coast of Hirado to the North as far as Kawatchi Bay, when it is necessary to steer for the opposite shore, to avoid the Asama, before entering the narrow part of Hirado Strait, at Red Cliff Point, from which the vessel must be guided by the directions on pages 888-9.

When clear of the northern entrance of the strait, the course along the land is N.E. by E. to Hato saki, distant 17 miles, steering for the clump beyond it which is on the East bluff of Ogawa, the eastern of the three islands North of Hato saki and Yobuko, and passing between the bluff S.E. point of that island and the dangers South of it, but this channel is narrow and somewhat dangerous. The same course will lead well outside the No o se or Dove and Nagamo or Ellis Reefs, which are 3 miles off shore, and may both be covered, and outside but rather close to Swain Reef.

A preferable track may be pursued from Spex Strait, steering from it on a N.E. $\frac{1}{2}$ E. course to pass between Madara and Kagara, and rounding the N.W. point of the latter at a mile; from this a N.E. by E. $\frac{1}{2}$ E. course will lead up

close to the West point of Wilson Island, passing half a mile westward of Yebosi.

Should the passage have been made by the Korea Strait, after rounding the North point of Iki sima, steer E. $\frac{1}{2}$ N. for the Siro simas at the entrance of the Inland Sea, passing well northward of Orono sima with a clear run of 55 miles. The tidal streams here are not very well known.

The SEA of JAPAN, bounded on the East and South by the Japanese Archipelago, and on the West and N.W. by the coasts of Korea and Russian Tartary, is about 900 miles long, N.N.E. and S.S.W., and 600 miles wide. East and West, at its broadest part. As far as is known, it is clear of rocks or dangers, with the following exceptions:—

Liancourt Rocks were discovered by the French ship *Liancourt*, in 1849; they were also called Menalai and Olivutsa Rocks by the Russian frigate *Pallas*, in 1854; and Hornet Islands by H.M.S. *Hornet*, in 1855. Captain Forsyth, of the latter vessel, gives their position as lat. $37^{\circ} 14' N.$, long. $131^{\circ} 55' E.$, and describes them as two rocky islets, covered with guano, extending about 1 mile N.W. by W. and S.E. by E., and apparently joined by a reef. The western islet, about 410 ft. high, has a sugar-loaf form; the eastern is much lower, and flat-top ped.

MATSU SIMA, or *Dagelet Island*, is a collection of sharp conical wooded hills, crowned by an imposing peak, 4,000 ft. high, in the centre, in lat. $37^{\circ} 30' N.$, long. $130^{\circ} 53' E.$ It is 18 miles in circumference, and there are several detached high rocks along its shores, some reaching an elevation of 400 to 500 ft. The shores are so steep that soundings could only be obtained by the *Acteon's* boats, almost at the base of the cliffs. Landing may be effected in fine weather with difficulty. In spring and summer some Koreans reside here, and build junks; they also collect and dry large quantities of shell-fish.

Waywoda Rock is said to have been discovered by the Russian corvette *Waywoda*. It appeared to be 12 ft. high, 70 ft. broad, and its approximate position is lat. $42^{\circ} 14' N.$, long. $137^{\circ} 17' E.$

TSU SIMA, at the southern entrance to the Sea of Japan, in the Korea Strait, is 37 miles long, N.N.E. and S.S.W., and belongs to Japan. Some reefs and rocks lie off its North and S.W. ends; a berth, however, of $1\frac{1}{2}$ mile will clear everything. At high water a deep sound divides it into two parts, the eastern part of this sound being an artificial canal, with 4 ft. in it at high water. The southern portion is mountainous, rising to a height of 2,126 ft., and on the North side is a double sharp peak, 1,700 ft. high, named *Uyama*, forming like asses' ears when bearing S.E. The northern portion is much lower. The western entrance to Tsu sima Sound is $1\frac{1}{2}$ mile wide, and clear of danger except close to the shore. This spacious inlet possesses a large number of small landlocked harbours and basins, all of them having deep water, and vessels

can moor to the rocks and trees. Vessels requiring to be hove down would find this sound well adapted for careening purposes.

The *Acteon* anchored in 9 fathoms in *Ima-haru Bay*, on the South side of the entrance, about 2 cables South of Observatory Rock, the southernmost of two small rocks connected with the mainland at low water. This is a convenient anchorage for sailing vessels, or if only intending a short stay. Wood, water, and vegetables were obtained, and some cattle and pigs were seen; the cornfields swarmed with pheasants. Coal exists on the N.W. side of the island. It is high water, on full and change, at 8^h 30^m, and the rise is 8 ft.

Itsuhara Bay, on the East side of Tsu sima, in lat. 34° 12', is open from E. by S. to S.E. by E. *Itsuhara*, the capital, is situated on the N.W. shore. The telegraph cable between Japan and the Korea is landed here.

Ajiro Bay, at the N.E. end of Tsu sima, in lat. 34° 39', is reported by the Japanese to be a good and safe anchorage at all times.

The JAPANESE CURRENT.—In the Chapter devoted to the Currents this remarkable stream will be more particularly described in its extent, but a few words here will form a fitting conclusion to this description of the Japan Archipelago.

On the Japanese charts the current is noticed as passing eastward off the S.E. coast of Nipon, and is called *Kuro Siwo*, or the Black Stream, or *Kuro-segawa*, the current of the Black Gulf, from the bluish-black colour of its waters. It was noticed by all early navigators, and more extended observation has shown its analogy with the Gulf Stream of the Atlantic.

This immense oceanic current has its origin in the great North Equatorial Current, which, on reaching the eastern shores of the Philippine Islands, is deflected to the northward, and forms, eastward of the South end of Formosa, the commencement of the *Kuro siwo*. Hence it flows rapidly between the East coast of Formosa and the Meiacu sima group, and then takes a north-easterly direction, westward of the Lu-chu Islands. Off the South end of Kiusiu a branch turns to the northward into the Sea of Japan, gradually decreasing in velocity, and again flowing into the ocean through Tsugar and La Pérouse Straits.

The main body of the current passes to the E.N.E. between the islands North of the Linschoten group, and through Van Diemen Strait, and then along the southern shores of Kiusiu and Sikok, forming, near its margin, races and tide-rips. After flowing through the chain of islands southward of Yedo Gulf, the northern edge of the current leaves the coast of Nipon, and flows in a north-easterly direction, a cold Arctic current, setting to the southward, intervening between it and the N.E. shores of Nipon and Yezo. It now commences to expand, its velocity greatly diminishes, and in about 150° E. it

divides, one stream, known as the Kamchatka Current, flowing to the northward to Behring Sea, and the greater portion continuing to the eastward, merging in the general easterly drift.

During the S W. monsoon the drift current from the China Sea joins the main body of the Kuro siwo, which attains its greatest velocity, 2 to 3 knots an hour, when abreast Sikok, where it has been known to set 100 miles in 24 hours. At this season its maximum temperature is 86° , which differs about 12° from that of the ocean due to the latitude. Off Nipon the N.W. edge of the stream is strongly marked by a sudden thermal change in the water of from 10° to 20° ; but the southern and eastern limits are less distinctly defined, there being a gradual thermal approximation of the air and water. A floating seaweed is found in the stream, resembling the *Fucus natans* of the Gulf Stream.

This current, however, is considerably influenced in its limits and velocity by winds and local causes, as hereafter described.

Along the borders of the stream, where it chafes against the counter currents and torpid waters of the ocean, as also in its midst, where whirls and eddies are produced by islands and the inequalities in its bed, strong tide-rips are encountered, often resembling heavy breakers on reefs or shoals.



SECTION III.

THE ISLANDS OF THE NORTH PACIFIC OCEAN.

IN the companion volume to this—that describing the South Pacific Ocean—allusion has been made to the imperfect notion that is given by inspecting a map, of the importance and relative size of the innumerable islands which are scattered over these oceans. In many instances the minute coral spot, which makes a considerable feature on the chart, could not be visibly represented of its proper dimensions; and this exaggeration is enhanced by the several names by which it is distinguished, which seem to add to its size and area. By far the greater number of islets are of this coral formation. A few of the well-known groups are volcanic, lofty, and of considerable dimensions; but the aggregate area of the dry land of the coral islands is remarkably small. In most instances it is a mere strip surrounding the central lagoon, but of surpassing fertility, and supporting an immense population in proportion to the actual area.

With a large proportion of the groups we are sufficiently intimate to affirm that they are tolerably well represented; but in many instances they have not been so accurately surveyed as they ought to be, and the sameness of their character renders this remark of the more importance, as it is difficult in many instances to distinguish between small spots which so much resemble each other. In the ensuing lists and descriptions we have stated the authority on which the descriptions and the geographical position depend.*

As the structure, growth, and foundation of the coral islands is among the most wonderful of all natural problems, we give here some extracts from the work of Charles Darwin, Esq., who, while he accompanied the late Admiral

* In this edition it has not been thought necessary to repeat the quotations of the authorities which were given *in extenso* in the first edition. To that work we, therefore, refer the reader who may be interested in the history of the hydrography of the Pacific.

FitRoy in the Expedition in the *Beagle*, accumulated those stores of knowledge which he made such abundant use of in later years. We confine the extracts strictly to those remarks bearing on the structure of the coral islands.

Mr. Darwin says:—I will now give a very brief account of the three great classes of coral reefs, namely, Atolls, Barrier, and Fringing Reefs, and will explain my views on their formation. Almost every voyager who has crossed the Pacific has expressed his unbounded astonishment at the lagoon islands, or as I shall for the future call them by their Indian name of Atolls, and has attempted some explanation. Even as long ago as the year 1606, Pyrard de Laval well exclaimed "C'est une merveille de voir chacun de ces atollons, environné d'un grand banc de pierre tout autour, n'y ayant point d'artifice humain." The immensity of the ocean, the fury of the breakers, contrasted with the lowness of the land and the smoothness of the bright green water within the lagoon, can hardly be imagined without having been seen.

In previous theories a most important consideration has been overlooked, namely, on what have the reef-building corals, which cannot live at a great depth, based their massive structure?

Numerous soundings were carefully taken by Captain FitRoy on the steep outside of Keeling Atoll, and it was found that within 10 fathoms the prepared tallow at the bottom of the lead invariably came up marked with the impression of living corals, but as perfectly clean as if it had dropped on a carpet of turf; as the depth increased the impressions became less numerous, but the adhering particles of sand more and more numerous, until at last it was evident that the bottom consisted of a smooth sandy layer: to carry on the analogy of the turf, the blades of grass grew thinner and thinner, till at last the soil was so sterile that nothing sprang from it. From these observations, confirmed by many others, it may be safely inferred that the utmost depth at which the corals can construct reefs is between 20 and 30 fathoms. Now there are enormous areas in the Pacific and Indian Oceans, in which every single island is of coral formation, and is raised only to that height to which the waves can throw up fragments, and the winds pile up sand.

From the fact of the reef-building corals not living at great depths, it is absolutely certain that throughout vast areas, wherever there is now an Atoll, a foundation must have originally existed within a depth of from 20 to 30 fathoms from the surface. It is improbable in the highest degree that broad, lofty, isolated, steep-sided banks of sediment, arranged in groups and lines hundreds of leagues in length, could have been deposited in the central and profoundest parts of the Pacific and Indian Oceans at an immense distance from any continent, and where the water is quite limpid. It is equally improbable that the elevatory forces should have uplifted, throughout the above vast areas, innumerable great rocky banks within 20 to 30 fathoms, or 120 to 180 feet of the surface of the sea, and not one single point above that level; for where, on the whole surface of the globe, can we find a single chain of mountains, even a few hundred miles in length, with their many summits rising within a few feet of a given level, and not one pinnacle above it? If, then, the foundations whence the atoll-building corals spring, were not formed of sediment, and if they were not lifted up to the required level, they must of necessity have subsided into it; and this at once solves the difficulty. For as mountain after mountain, and island after island, slowly sank beneath the water, fresh bases would be successively afforded for the growth of the corals.

Before explaining how Atoll reefs acquire their perpendicular structure, we must turn to the second great class, namely, Barrier Reefs. These either extend in straight lines in front of the shores of a continent or of a large island, or they encircle smaller islands; in both

cases being separated from the land by a broad and rather deep channel of water, analogous to the lagoon within an atoll. It is remarkable how little attention has been paid to encircling barrier reefs, yet they are truly wonderful structures. In the Island of Bola-Bola the whole line of reef has been converted into land; but usually a snow-white line of great breakers, with only here and there a single low islet crowned with cocoa-nut trees, divides the dark heaving waters of the ocean from the light green expanse of the lagoon channel. And the quiet waters of this channel generally bathe a fringe of low alluvial soil loaded with the most beautiful productions of the tropics, and lying at the foot of the wild, abrupt, central mountains. Encircling barrier reefs are of all sizes, from 3 miles to no less than 44 miles in diameter; that which fronts one side, and encircles both ends of New Caledonia, is 400 miles long. The depth within the lagoon channel also varies much: from 10 to 13 fathoms may be taken as an average; but at Vanikoro there are spaces no less than 56 fathoms, or 336 feet deep. Internally the reef either slopes gently into the lagoon channel, or ends in a perpendicular wall sometimes between 200 or 300 feet under water in height; externally the reef rises, like an atoll, with extreme abruptness out of the profound depths of the ocean. What can be more singular than these structures? We see an island, which may be compared to a castle situated on the summit of a lofty submarine mountain, protected by a great wall of coral rock, always steep externally, and sometimes internally, with a broad level summit, here and there breached by narrow gateways, through which the largest ship can enter the wide and deep encircling moat.

As far as the actual reef of coral is concerned there is not the smallest difference in general size and outline, grouping, and even in quite trifling details of structure, in a barrier and an atoll. The geographer Balbi has well remarked that an encircled island is an atoll, with high land rising out of its lagoon: remove the land, and a perfect atoll is left.

But what has caused these reefs to spring up at such great distances from the shores of the included islands? It cannot be that the corals will not grow close to the land; for the shores within the lagoon channel, when not surrounded by alluvial soil, are often fringed by living reefs; and we shall presently see that there is a whole class, which I have called *Fringing Reefs*, from their close attachment to the shores both of continents and of islands. Again, on what have the reef-building corals, which cannot live at great depths, based their encircling structures? This is a great apparent difficulty, analogous to that in the case of atolls, which has generally been overlooked.

On what are these barrier reefs based? Are we to suppose that each island is surrounded by a collar-like submarine ledge of rock, or by a great bank of sediment ending abruptly where the reef ends? If the sea had formerly eaten deeply into the islands before they were protected by the reefs, thus having left a shallow ledge round them under water, the present shores would have invariably been bounded by great precipices; but this is very rarely the case. Moreover, on this notion, it is not possible to explain why the corals should have sprung up, like a wall, from the extreme outer margin of the ledge, often leaving a broad space of water within, too deep for the growth of corals. The accumulation of a wide bank of sediment all around these islands, and generally widest where the included islands are smallest, is highly improbable, considering their exposed positions in the central and deepest parts of the ocean. On what then are these barrier reefs based? Why, with their wide and deep moat-like channels, do they stand so far from the included land? We shall soon see how these difficulties disappear.

We come now to the third class of *Fringing Reefs*, which will require a very short notice. Where the land slopes abruptly under water, these reefs are only a few yards in width, forming a mere ribbon or fringe round the shores; where the land slopes gently under the water, the reef extends further, sometimes as much as a mile from the land; but in such cases the soundings outside the reef always show that the submarine prolongation of the

land is gently inclined. In fact, the reefs extend only to that distance from the shore at which a foundation within the requisite depth, from 20 to 30 fathoms, is found. As far as the actual reef is concerned, there is no essential difference between it and that forming a barrier or an atoll; it is, however, generally of a less width, and consequently few islets have been formed on it. From the corals growing more vigorously on the outside, and from the noxious effect of the sediment washed inwards, the outward edge of the reef is the highest part, and between it and the land there is generally a shallow sandy channel a few feet in depth. Where banks of sediment have accumulated near to the surface, as in parts of the West Indies, they sometimes become fringed with corals, and hence in some degree resemble lagoon islands or atolls; in the same manner as fringing reefs, surrounding gently-sloping islands, in some degree resemble barrier reefs.

No theory on the formation of coral reefs can be considered satisfactory which does not include the three great classes. We have seen that we are driven to believe in the subsidence of those vast areas, interspersed with low islands, of which not one rises above the height to which the wind and waves can throw up matter, and yet constructed by animals requiring a foundation, and that foundation to lie at no great depth. Let us, then, take an island surrounded by *fringing reefs*, which offer no difficulty in their structure, and let this island with its reef slowly subside. Now, as the island sinks down, either a few feet at a time or quite insensibly, we may safely infer, from what is known of the conditions favourable to the growth of coral, that the living masses, bathed by the surf on the margin of the reef, will soon regain the surface. The water, however, will encroach a little by little on the shore, the island becoming lower and smaller, and the space between the inner edge of the reef and the beach proportionably broader. Coral islets are supposed to have been formed on the reef; and a ship is anchored in the lagoon channel. This channel will be more or less deep, according to the rate of subsidence, to the amount of sediment accumulated in it, and to the growth of the delicately branched corals which can live there. We can now see why encircling barrier reefs stand so far from the shores which they front. We can also perceive that a line drawn perpendicularly down from the outer edge of the new reef to the foundation of solid rock beneath the old fringing reef will exceed, by as many feet as there have been feet of subsidence, that small limit of depth at which the effective corals can live; the little architects have built up their great wall-like mass, as the whole sank down, upon a basis formed of other corals and their consolidated fragments. Thus the difficulty on this head, which appeared so great, disappears.

If instead of an island we had taken the shore of a continent fringed with reefs, and have imagined it to have subsided, a great straight barrier, like that of Australia or New Caledonia, separated from the land by a wide and deep channel, would evidently have been the result.

Let us take our new encircling barrier reef, and let it go on subsiding. As the barrier reef slowly sinks down, the corals will go on vigorously growing upwards; but as the island sinks, the water will gain inch by inch on the shore, the separate mountains first forming separate islands with one great reef, and finally the last and highest pinnacle disappearing. The instant this takes place a perfect atoll is formed. I have said, remove the high land from within an encircling barrier reef and an atoll is left, and the land has been removed. We can now perceive how it comes that atolls, having sprung from encircling barrier reefs, resemble them in general size, form in the manner in which they are grouped together, and in their arrangement in single or double lines; for they may be called rude outline charts of the sunken island over which they stand. We can further see how it arises that the atolls in the Pacific and Indian Oceans extend in lines parallel to the pre-

valling strike of the high island and great coast lines of those oceans. I venture, therefore, to affirm, that on the theory of the upward growth of the corals during the sinking of the land, all the leading features in those wonderful structures, the lagoon islands or atolls, which have so long excited the attention of voyagers, as well as in the no less wonderful barrier reefs, whether encircling small islands or stretching for hundreds of miles along the shores of a continent, are simply explained.

The arrangement of the following pages is similar to that pursued in the volume on the South Pacific, viz., the islands and groups are described in belts of latitude, each 10° in width, and proceed from the eastern side to the western side of the ocean in succession, commencing in this work with the Equator.

CHAPTER XII.

ISLANDS BETWEEN THE EQUATOR AND LAT. 10° N.

Following the plan adopted in the South Pacific Directory, we commence from the coast of America, and include in this Chapter the groups of islands, the Gilbert Archipelago, which lie on the Equator, the Marshall Archipelago to the North of it, and the Caroline Archipelago, lying within the same belt of latitude.

MALPELO ISLAND, in lat. 3° 55' N., or, according to Commander Aldham, H.M.S. *Swift*, July 22, 1851, 4° 3' N., long. 81° 36' W., is a barren, high, perpendicular rock, which may be seen in clear weather at the distance of 60 miles, the summit being 1,200 ft. above the sea level. A small quantity of green moss, and a few dwarf bushes, which grow in its cracks and gulleys, afford the only verdure that it possesses. It is surrounded with islets, and the whole may extend about 9 or 10 miles, from North to South. The centre of this island bears a resemblance, in several points of view, to the crown of a head, and its being barren accounts naturally enough for the name (bald head) which the Spaniards have bestowed on it. It is surrounded, as it were, by a strong current, having much the appearance of breakers, which, setting into the gulf, and, being accompanied by light winds, with thick and hazy weather, Colnett did not think it deserving of any further attention. The current was found to set N.E. by E., 2½ miles an hour. Another statement is made that they run violently to the southward and westward near it, a difference possibly owing to the different seasons they have been observed in. Colnett's was in July, 1793. The rock itself has 40 fathoms alongside of it, and 110 fathoms at a quarter of a mile distant.

RIVADENEYRA SHOAL.—"Being on board the steamer *Peru*, abreast of Puná, October 22, 1842, and hearing that there was a terrible yellow fever raging at Guayaquil, the steamer put back, and I was placed on board a small schooner going to Realejo. On the 28th, in the middle of the day, the sea calm, we had caught a large turtle, when I observed, at a few fathoms off, a slight swell on the sea; we took the boat and went to it, when we sounded,

and, to our astonishment, found only 16½ ft. (French?) of water. In the centre of this singular spot was only 10 ft. depth; we then found 14, 16, 27, 56 feet, and no bottom. By our very imperfect instruments we made it to be in 5° 32' N., long. 85° 10' W. of Greenwich; but this we considered nearly correct, as we hastened on to Realejo."—*M. Rivadeneyra*.

The existence of this bank has been in some degree confirmed by the enquiries of Capt. Lapelin, in the French corvette *La Brillante*, in 1852. He ascertained that several vessels had struck on it, but did not gain any information as to the correctness of the position assigned. Capt. Harvey, of H.M.S. *Havannah*, passed within 4 miles of the place in July, 1857, without seeing anything of it.

COCOS ISLAND.—The discovery of this island is involved in obscurity. It is mentioned as being well known by early navigators, Lionel Wafer, Dampier, &c. Its more exact position and character appear to have been first ascertained by the Spanish exploring ships, the *Descubierta* and *Atrevida*, in 1791. It was then visited, and, it is stated, surveyed, by Capt. Colnett in 1793. In 1795 it was visited by Vancouver, who also examined it. There are some singular discrepancies in the accounts given by these different visitors, more particularly in those of the two last named. Vancouver states it to be 4½ miles in length, N.E. and S.W., while Colnett states it to be 12 miles; and the respective plans given also coincide with the descriptions. These discrepancies were decided in Vancouver's favour by Sir Edw. Belcher, in 1838, who places the Observatory at the head of Chatham Bay, at the N.E. part of the island, in lat. 5° 32' 57" N., long. (corrected) 87° 2' 10" W.

The island, according to Mr. Whidbey's account, is about 12 miles in circuit, with several detached rocks and islets scattered around its shores. Off the S.W. point they extend to the greatest distance, nearly 2 miles, and would be dangerous if they were not sufficiently high to be seen and avoided.

The island itself is very high, sufficiently so to be seen at more than 60 miles distant; and Vancouver says that he lost sight of it at 46 miles W.N.W., not from sinking below the horizon, but from being obscured by haze. The West side is the highest, showing in the form of a round hill, descending to the northern extremity, off which lies a detached islet. From the eastward the southern part appears to rise abruptly from the sea, in steep rugged cliffs, to a considerable height. The northern side is indented into small bays, with rocks and islets lying near them. The shores are chiefly composed of broken cliffy perpendicular precipices, beyond which the surface rises unevenly to the summit of the island, the whole composed of one rude connected thicket of small trees, near the shore; but on the more elevated and interior parts of the island are many large spreading trees, among which are cocoa-nut trees, but not in such abundance as to distinguish the island.

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fresh water. Apparently it is quite pure, and is very easily to be procured at those points to which vessels can resort. Fish are abundant around the shores, but would not take bait; sharks in large shoals, and very voracious, are among the number. Fowl of the oceanic kind visit the island, and afford tolerable food. The cocoa-nuts, also, have been of great service to earlier navigators.* All the trees for fuel have been cut, and in 1838 there were no cocoa-nut trees remaining which were accessible. Pigs are abundant.

Chatham Bay is the easternmost anchorage on the island. Vancouver moored here in 33 fathoms, sand and gravel, good holding ground and free from rocks; the East point of the bay, which is a small conical islet close to the N.E. extreme of the island, bore S. 51° E., half a mile distant; the West point of the bay, S. 75° W.; a steep rocky islet lying off it, from S. 87° W. to N. 66° W.; and the watering place at the mouth of a very fine stream emptying itself over a sandy beach, S. 13° W., about three-quarters of a mile distant. Outside this the water deepens almost immediately. This bay is quite open to the North, and Colnett states that though he found the prevalent winds to be from South and West, he had it frequently strong from N.E. and North. Anchorage in 7 to 10 fathoms will be found farther in.

Wafer Bay, as it is named in Colnett's plan, is to the westward of the former, and 1 mile distant from the North point; it may be easily known by a small rugged barren rock, about the size of a large boat, lying about 1 mile West of the body of the bay. The bay also lies East and West, but is not adapted for vessels of above 200 tons; it is nearly sheltered from all winds. Vancouver says it is certainly not so eligible a situation for procuring the good things the island affords as the bay to the eastward, although a more copious stream of water flows into it.

The climate of the island is humid. Vancouver considered it (January) temperate and salubrious, but had heavy rains. Colnett, who stayed longer, experienced almost constant and very heavy rain. Flies, too, were very abundant and annoying.

The tide is an important object in anchoring here. The time of high water is at 2^h 10^m, rising and falling from 16 to 18 ft. The ebb sets to the East at the rate of 4 or 5 knots, and the flood, which is weaker, runs to the West. They are uninfluenced by currents. The current around is strong and irregular, but generally setting to the north-eastward at the rate of 2 knots.†

* Colnett states that his men drank an excessive quantity of the milk, which did not intoxicate, but so benumbed them that they were unable to move without assistance: this continued for four or five days.—*Voyage to the South Seas*, pp. 67-8.

† *Gallego Island* was placed on the charts in lat. 1° 48' or 1° 8' N., long. 104° W. Duncan Island was discovered in 1787, it is said, by Capt. Duncan, in a merchant vessel. He says the island is small and rocky, in lat. 6° N., long. 106° W. Admiral Krusenstern says it is probably the same island as L'Ile de la Passion, in 16° 54' N., 106° W. In 1872, Com-

WALKER ISLANDS.—A wide extent of ocean intervenes in this belt of latitude between the positions of the foregoing islands and that of the reported isolated cluster which are named as above. From a notice preserved by Mr. Purdy, they were discovered by Captain Walker, in 1814, and consisted of a group of small, low, and well-wooded islands, in lat. 3° 34' N., long. 149° 15' W. On some charts they are marked as *Low Woody Islands*, but their existence is doubtful.

JARVIS ISLAND.—Although this island is to the South of the Equator, it is so connected with the groups which are next described, that we give it a place here. It was discovered by Captain Brown, of the English ship *Eliza Francis*, August 21st, 1821. As it was surveyed by the *Peacock* and *Flying Fish* of Comm. Wilkes, U.S. Exploring Expedition, December, 1840, the position then ascertained must be preferred to others, lat. 0° 22' 33" S., long. 159° 54' 11" W. Wilkes describes it as a small coral island, triangular in shape, 1½ mile long East and West, and a mile wide North and South. No reef surrounds it, and it may therefore be safely approached, but it was considered very dangerous. It exhibits the appearance of a white sandy beach, 10 or 12 ft. above the sea, without a tree or shrub, and but a few patches of grass. A few sea-birds were seen about it.

It is one of the islands worked by the American Guano Company, and the description given by Mr. J. D. Hague shows that it is a *raised* coral island, the interior lagoon having disappeared, and its bed being now 7 or 8 ft. above the sea, with many marks indicating the gradual retreat of the sea. The vessels which came here for the guano moored to mooring-buoys in very deep water, in the same manner as at Baker Island.

It is certainly the same as *Bunker Island*, and perhaps, as no mention is otherwise made of it, as *Brooks Island*, placed in 1° 13' S., long. 159° 40' W. The other authorities generally place Jarvis Island somewhat to the West of Captain Wilkes's longitude.

CHRISTMAS ISLAND, a coral lagoon island, was discovered by Captain Cook, in the *Resolution* and *Discovery*, on Wednesday, December 24th, 1777. He remained there till January 2nd ensuing, and observed an eclipse of the sun, and from the season gave it the name. It is, like all other islands of the same nature, a belt of low land, enclosing a lagoon, which, however, in this case is very shallow. It is so low that the land cannot be seen more than 8

mander Harris, U.S.N., saw no indication of land or shoal in these localities, and from this and searches made by other U.S. vessels, it is obvious that they do not exist.

For further particulars of these, and other reported dangers, see the "Lists of Reported Dangers to Navigation in the Pacific Ocean," compiled at the U.S. Bureau of Navigation, Washington.

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or 10 miles off. The entrance into the lagoon is on the N.W. side, and is divided into two channels, fit only for boats, by a small island, on which Cook landed his instruments, and planted some cocoa-nuts, yams, and melon-seeds. Here he also left a memorial of his visit.

The low land is covered with stunted bushes, and a few cocoa-nut and palm trees here and there. From the S.E. to the N.W. points of the island the coast runs about N.W. by W. $\frac{1}{2}$ W., 22 miles, a deep bay running to the northward from a point of land about $13\frac{1}{2}$ miles from the S.E. point, near which were two conspicuous cocoa-nut trees, bearing about N.E. by E., *true*, when in one with the point. Close to the S.W. point are (or were) two or three groves of cocoa-nut trees, planted by Captain Cook. From the S.W. point the land trends N.E. $\frac{1}{2}$ N., $4\frac{1}{2}$ miles, to the entrance of the lagoon, and from thence it trends N. by W. $\frac{1}{2}$ W. to the N.W. point, which bears N. by E., 12 miles, from the S.W. point. In 1872 it was stated that the cocoa-nut trees had nearly all disappeared.

Cook's party dug for fresh water without success in several parts of it, consequently it was uninhabited, except by flocks of sea-birds. They also caught abundance of fish. No turtle were seen by Captain Scott, September, 1840, although Cook found an abundance.

In 1872 this island was visited by the U.S. ship *Narragansett*, and in 1874 by the *Portsmouth*, Commander J. S. Skerrett. The best anchorage is stated to be in 10 or 15 fathoms, sand, midway between Cook Island and Christmas Island to the northward, just off a breaking reef. This anchorage is smooth when the trades are blowing, but if the wind be southward of S.E., or northward of N.E., a heavy swell sets round the points. Guano has been obtained here by the American Guano Company. Very inferior water may be obtained by digging.

In November, 1857, the lumber barque *J. C. Fremont* was wrecked in the large bay on the East side of the island, and Capt. Hooper went to seek it in the brig *John Dunlap* and the schooner *Dolphin*, in 1858. He says:—

"On the S.W. point is a grove of cocoa-nut trees; on the North side of the bay and lagoon are two or three clusters, and one towards the S.E. point. The most distant clusters cannot be seen the one from the other, as they are 25 miles apart. In the large S.E. bay, where so many wrecks occur, there is no anchorage; the water is very deep close to the shore, with a strong tide and surf setting on it. The land is not over 10 ft. above the sea level in any part, and cannot be seen from a ship's deck more than 8 to 10 miles off. Navigators should, therefore, be cautious in approaching it.

"A singular circumstance noticed was that the fish, in the large lagoon near which the camps were erected, were all dead, and in passing over the water in a boat they could be seen at the bottom; also on the lee shore of this lake the fish were piled up in a state of preservation; on being broken in two they were

as sweet and wholesome as possible. The water of this lake is extremely salt, and stronger than any pickle ever used in curing fish or meat."

The large bight at the East end of the island is very dangerous, and a vessel getting into it at night will have a small chance of getting out after discovering the breakers.

Cook places the small islet in the entrance of the lagoon, now named *Cook Islet*, in lat. 1° 59' N., long. 157° 30' W., and Capt. Scott, H.M.S. *Samarang*, 1842, confirmed this position. Commander Skerrett places it in lat. 1° 57' 17" N., long. 157° 27' 46" W. It is high water, on full and change, at 4^h 23^m; springs rise 3 ft. 2 in.*

FANNING ISLAND was discovered by Captain Edmund Fanning, in the American ship *Betsy*, in 1798. The next recorded account of it was by Capt. Legoarant de Tromelin, who came here in the French corvette *La Bayonnaise*, in 1828, but his description does not at all accord with that of the discoverer; perhaps the coral island had increased in the interval. Prior to 1855 an Englishman, Capt. Henry English, had established himself here with a few white companions and about 150 natives of Humphries Island and other places, to trade in the production of cocoa-nut oil. They placed themselves under British protection, when Capt. W. H. Morshead, R.N., came here in H.M.S. *Dido*, on October 16, 1855. It was visited by Capt. Pearse, in H.M.S. *Alert*, in 1861, and was accurately surveyed by Capt. G. H. Richards, R.N., in H.M.S. *Hecate*, in 1863.†

Fanning Island is of coral formation, of the lagoon type, and in shape a rude oval, 9½ miles long, N.W. and S.E. Towards the centre it is about 3½ miles wide, but towards its south-eastern end 5½ miles; and its circumference is 27 miles. It is skirted by a small reef extending all round the island, but only to the distance of half a cable from the beach, and against this the ocean swell breaks, but seldom with any violence. Outside the reef there is no danger of any kind. The belt of land, which forms the island has an average breadth of half a mile, and only at one spot, near its North end, does it exceed three-quarters of a mile; it is densely covered with cocoa-nut trees, which produce

* *Sarah Anna Island*, announced in the New York Tribune, March, 1858, as lying in lat. 4° 0' N., long. 154° 22' W., is doubtful, as Vancouver passed near the position. It may be the same as Malden Island, nearly on the same meridian, but in 4° South.

† It is not improbable but that this may be the *American Isles*, stated by Kotzebue to have been discovered by Captain Mather, of the *American*, in 1814, 28' more to the West, and also the *Weeks Island* of whaler report, lat. 3° 47' N., long. 158° 37' W. It is singular that Capt. Hudson, of the U.S. Exploring vessel *Peacock*, should be satisfied that there is no other island than Washington Island hereabouts. He states that he diligently sought for eight days the positions where five islands have been reported to exist, but no land was seen. Perhaps the strong and various currents hereabouts may have led to some confusion.

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fruit of the very finest description, but the regularity of the forest is occasionally broken by gaps, leaving thick clusters of trees standing apart, with a low coral space between. One very conspicuous gap is near the N.E. point of the island, and the continuity of the belt of land is greatly broken there.

English Harbour.—The lagoon is spacious, but generally shallow and full of coral heads. The entrance is near the centre of the S.W. side of the island, where the channel is about 1½ cable wide, but not navigable for large vessels over half that width. Just outside the entrance, 2½ cables, W. by S., from the flagstaff on the South point, the depths vary from 24 to 40 ft., decreasing to 15 ft. and less towards the coral reef. The northern side of the entrance is the shoalest, and the depth at three-quarters of a cable from the northern shore does not exceed 15 ft., but at one-third to half a cable distance from the southern shore the depth is 30 and 32 ft. Inside is a tolerably extensive basin which affords safe anchorage, in 4½ to 5 fathoms, bottom of coral and sand, with the flag-staff bearing S.W. ½ S., distant 1½ cable. This is English Harbour, which Capt. Morshead said would be an invaluable spot for a rendezvous. The holding-ground is good, and there is sufficient room for several vessels, when properly moored, to lie in perfect safety. Farther in the soundings decrease to 16 and 12 ft., and there are besides several shoal spots; beyond these there is again deep water. Vessels should only attempt to enter this harbour at slack water.

It is high water, on full and change, at 6½; springs rise 3 ft. The stream in the harbour turns at high and low water, and runs from 4 to 5 knots.

Whaleman Anchorage.—There is excellent anchorage for ships on the West side of the island, towards the N.W. end, and 2½ miles north-westward of the entrance to English Harbour; it is called Whaleman Anchorage or Bay, but has no title to the latter denomination. The depth of water is said to range from 8 to about 15 fathoms at half a mile from the beach. Here ships of the largest class have at times anchored to procure a supply of fresh water, which is abundant adjacent to the anchorage.

The trade-winds blow steadily from the eastward almost all the year round, and the island is seldom or never the scene of any boisterous weather. The months of March and April are generally the worst.

The flag-staff at English Harbour is in lat. 3° 51' 26" N., long. 159° 22' W.; Point Alert (the East extreme of the island, near which there is a gap in the continuity of the cocoa-nut forest), in lat. 3° 52', long. 159° 15'; the North extremity of the island in lat. 3° 56½', and nearly on the meridian of the flag-staff at English Harbour; the South extremity in lat. 3° 48½'.

The island is very fertile, and produces bananas, pumpkins, *taro*, figs, melons, cabbages, radishes, tomatoes, and numerous other garden vegetables, introduced by the settlers. Every facility is afforded for procuring fire-wood and water, as well as any fruit and vegetables in season, and the visits of whalers

North Pacific.

for this purpose are not infrequent. Fish is abundant in the lagoon. The gigantic land-crab is found here.

Bound from Honolulu and the northward, make the island on the East side, and sail round the South side. Ships must be careful in entering the harbour, as the coral reefs project farther seaward there than elsewhere; but probably a pilot can be procured.

WASHINGTON ISLAND was discovered by Capt. Fanning, the day after he had discovered the island bearing his name to the S.E. It has also been called *New York Island* on the charts, and is probably the *Prospect Island* announced in 1858. According to Captain Wilkes, it is in lat. 4° 41' 35" N., long. 160° 15' 37" W., very nearly the position originally assigned. It was surveyed by Commander Skerrett, U.S. ship *Portsmouth*. It is 3½ miles long by 1½ mile broad, elevated about 10 ft. above the sea, and is entirely covered with cocoa-nut and other trees, exhibiting a most luxuriant growth. There is a reef off its eastern point, which extends for half a mile. At the western end a coral ledge extends 2 miles in a N.W. by W. direction, on which the water appears much discoloured, but the sea was not seen to break upon it, except close to the point of the island. The surf is very heavy, and the island affords no anchorage; it is inhabited, but landing is dangerous. There is stated to be a lake of brackish water on this island.

PALMYRA ISLAND was discovered, November 7, 1802, by an American vessel of the name, during her passage from Juan Fernandez to Manila. According to the description of her commander, Capt. Sawle, it was uninhabited, flat, and has a lagoon in its centre, in which the tide regularly ebbs and flows, running in and out at a rate of 6 or 7 knots. The *Palmyra* anchored on the N.W. side of the island, in 20 fathoms, at three-quarters of a mile off shore. Abundance of turtle were found, but no fresh water.

It was taken possession of by Capt. Zenas Bent, of Honolulu, for the Hawaiian Government, in 1862, having been previously claimed for the American Guano Company. Capt. Bent says the landing place is on the West end, and a vessel can be in perfect safety in a depth of 3 fathoms. Some people were left on it to cure biche-de-mer.

Palmyra Island was surveyed by Commander J. S. Skerrett, U.S. ship *Portsmouth*, 1874. According to this survey, it consists of numerous small islands, none rising over 6 ft. above the sea, and all covered with cocoa-nut trees, lying round the edge of an extensive reef, 5½ miles in extent East and West, and 1½ mile wide, though Capt. Sawle states that it is 14 miles long, and about 7 miles wide, and Captain Bent 10 miles long, and 6 miles wide. Breakers extend a mile from the N.E. and S.E. islets. The lagoon within the islands is nearly blocked up by reefs, its entrance at the western end being only available for boats. On the North, East, and West sides the reefs are

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marked by breakers, but off the West end a bank of soundings extends 2½ miles to W. by N., the depths on it being uneven, and varying from 4 to 14 fathoms, coral bottom.

It is dangerous to approach Palmyra Island from the northward or westward; the safest approach is from the southward. A vessel may stand safely in by keeping Strawn Island, on which the huts are erected, bearing about N.E. ½ N., and run in until Bird Island, the S.E. islet, bears E. ½ N., when she may anchor in 7 fathoms, about 1½ mile W. by S. ½ S. from Palm Point, the S.W. islet. The water shoals rapidly from 30 fathoms. It is high water, on full and change, at 5^h 23^m; springs rise 2 ft. The observation spot, about 2 cables N.E. of Palm Point, is in lat. 5° 49' 4" N., long. 162° 11' 29" W. Capt. Bent placed the West end in lat. 5° 50', long. 161° 53', but Capt. Sawley places it 30 miles to the westward.

A few people reside on Strawn Island, near the N.W. end of the group, engaged in curing cocoa-nuts. Fish is abundant, but turtle is scarce; curlew, snipe, and plover were found. There is generally a small pool of rain-water on one of the eastern islets. Rain is almost constantly falling.

Samarang Isles were discovered by Captain Scott, in H.M.S. *Samarang*, September 15th, 1840, and the description of them exactly agrees with that of Palmyra Island. The U.S. ship *Portsmouth*, 1874, spent two days in searching for them, without finding them or any indications of shoal water, so that Samarang Isles and Palmyra Island are supposed to be identical, though there is a difference of 54' of latitude between the recorded positions. According to Capt. Scott, the West islet is in lat. 4° 55' 9", long. 162° 22' 20" W.

With the strong currents experienced by the *Samarang* in this neighbourhood, a more dangerous spot to those navigating these seas, unacquainted with its existence, can scarcely exist than this group of coralline islets, with their extensive reefs. Had it not providentially fallen calm during the night, the *Samarang* must inevitably have been lost, as her course would have taken her directly on to the reef.*

* DOUBTFUL ISLANDS.—*Madison Island*, from whaler report, latitude 5° 30' N., long. 169° 0' W., is probably Washington Island.

Four Islands, said to be in lat. 4° 32' N., long. 169° 32' W. Captain Stone, of the brig *Josephine*, in quest of guano islands, sought for this group, but was assured that no islands or dangers existed within 250 miles of the place.

Perhaps this last assertion may include *Davis Island*, said to have been found in 1858, in lat. 6° 40' N., long. 170° 10' W.

An island or shoal, in lat. 6° 36' to 6° 41' N., long. 166° 0' to 166° 18' W., has been four times announced by whalers. Captain Stone, in the *Josephine*, ran near the first position at mid-day; good observations; and although many birds were seen, among them land birds, yet no land was seen. To these may be added an island in 8° 40' N. and 168° 0' W., from whaler report, which is probably *Barber Island*, if that exists. Commodore Skerrett, U.S. ship *Portsmouth*, searched unsuccessfully for all these islands.

Kingman or Alice Thorndike Reef.—Capt. Kingman, of the American ship *Shooting Star*, saw this shoal lying to the northward of Palmyra Island. It is composed of coral and sand, and when the breakers on the N.E. part bear East, with a moderate breeze, a few small spots of coral can be seen above water. The northern part runs E.S.E. and W.N.W., 12 miles. Shoal water extends several miles to the southward. The position ascertained was 6° 27' N., long. 162° 12' W. The ship *Alice Thorndike* also saw it in 1859, placing it in lat. 6° 24' N., long. 162° 22'. Another authority places it in lat. 6° 30' N., long. 162° 30'. The probable position is therefore 6° 27½' N., 162° 21' W. In June, 1874, the British steam-ship *Tartar* struck on it.* *Caldew Reef*, reported to lie to the eastward, in lat. 6° 24', long. 161° 44', is also probably identical with Kingman Reef.

In this locality reefs have been frequently reported, varying but little in position in latitude but considerably in longitude, and it is probable that different positions have been given to the same reef, and that the error has been caused by incorrect reckoning and strong currents. Until this locality has been more thoroughly examined, great precaution should be taken in its navigation.

Maria or Crane Shoal was announced in 1863 by Captain Crane, of the schooner *Maria*. She ran over a reef, the rocks of which were seen with about 4 fathoms over them; lat. 5° 53' N., long. 164° 0' W. They were searched for in vain by the U.S. ship *Portsmouth*.

BAKER ISLAND is a low coral island of similar character to those around it, but it had a large deposit of guano on it, which has been worked by the American Guano Company, and, therefore, it is better known.

It was seen by Capt. H. Foster, of the barque *Jamaica*, and has been many times vaguely reported, as *Phæbe Island* (see hereafter), or *New Nantucket*

Barber Island is also placed in lat. 5° 0' N., long. 177° 54' W., and in lat. 8° 4' N., long. 170° W.

Another island, which may be *Barbery Island*, is said, from whaler report, to be in lat. 8° 0' N., long. 177° 20' W., or in lat. 9° N., long. 178° W.

Barbery Island, from a report in the New York Tribune, March, 1858, exists in lat. 3° 54' N., long. 173° 0' W., and it has also been placed 90 miles West of this position. (This seems to be a peculiarly vague designation.)

Four Rocks, from whaler report, in lat. 7° 51' N., long. 176° 6' W. Another rock, in lat. 7° 48' N., long. 173° 12' W. Probably do not exist.

Diana Shoal, reported by Captain Henry English, in lat. 8° 40' N., long. 157° 20' W., had only 6 ft. water over it. The *Herald* passed over the site without seeing anything.

* From whaler reports in the China Mail, a shoal lies in lat. 6° 36' N. and 160° 0' W.; another report says lat. 6° 30' N., long. 163° 30' W. The latter was searched for unsuccessfully by the U.S. ship *Portsmouth*. These probably refer to the Kingman Reef.

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Island. Seven positions have been assigned, varying slightly from that given by Capt. J. D. Hague, lat. 0° 13' N., long. 176° 23' W.; from observations made on the U.S. ship *Narragansett*, Commander Meade, 1872, the centre of the island was assumed to be in lat. 0° 13' 30' N., long. 176° 29' 30' W.

The island is about 20 ft. high, and shows some signs of elevation; the surface is nearly level, and almost entirely devoid of vegetation, except patches of grass here and there. The outline is an irregular quadrilateral figure about 1 mile long, East and West, and three-quarters of a mile wide, North and South; it is surrounded by a reef 200 to 400 ft. wide, awash at high tide. Fresh water is obtained by distilling sea-water.

Above the crown of the beach there is a sandy ridge which encircles the guano deposit. This marginal ridge is about 100 ft. wide on the lee side of the island, and is there composed of fine sand and small fragments of corals and shells mixed with considerable guano. On the eastern or windward side it is much wider, and formed of coarser fragments of corals and shells which, in their arrangement, present the appearance of successive beach formations. Encircled by this ridge lies the guano deposit, which occupied the centre and the greater part of the island. None of the grass that grows abundantly on the margin is found on the guano. In 1872 the guano was nearly worked out.

On the West side is a small open bay, in which is a boat entrance; immediately opposite to which are the Company's buildings, and close to it (to the northward) is the wharf. Outside of the reef the downward trend of the island under water is so abrupt that an anchor will not grapple, but falls away towards the bottom of the deep ocean. For this reason it was found necessary to anchor large mooring-buoys outside the reef.

Mr. Charles Reeves, of the guano ship *Loch-na-gar*, gives the following remarks.—(*Mercantile Marine Magazine*, January, 1869.)

The wooden houses upon the island can be seen 14 miles from the mast-head; but if a ship should be at the buoy there, she can be seen long before the island. On approaching, care should be taken not to be set to leeward by the current, which constantly sets W.S.W., 2 knots an hour. If a ship once gets to leeward, she may be weeks before she is able to beat up to the island again.

As soon as the island is visible, the jack should be hoisted at the fore-royal mast-head, and as a matter of precaution the royal taken it, to make certain of the jack being seen. As soon as she is made out as bound to the island, the American ensign will be hoisted from the signal-staff, if it is favourable for coming to the buoy. But should the ensign not be hoisted by the time the ship is close to the island, it is a sign that there is too much danger to come to the buoy. Therefore be prepared to haul to the wind when they hoist up "Stand to Sea," and carry all possible sail to hold your own against the current.

But when the ensign is hoisted, get up your best lines to run to the buoy;

they sometimes have lines at the island, but just as frequently as not they have been carried away, and they have to depend upon yours. Steer for whichever end of the island will give you the weather gage, for you will have to luff round the lee side of the island to the buoy. The mooring-master comes on board about 2 miles from the island and takes charge.

The easterly winds are frequently interrupted by squalls from the westward, more especially from November to March.

As soon as dark clouds are observed gathering up to the westward, do not hesitate a moment, but slip at once before the easterly wind fails. If you are tempted to hang on, and the easterly wind fails, the ship swings round, and no power can save her from destruction. The wreck-strewn shore bears melancholy evidence of this.

It frequently happens, during the winter months, that heavy surfs set in all round the island. It would then be advisable for the ship to go to sea if there is any wind to slip, for there is no communication with the shore except by signal, and there is great risk of the ship being lost.

The winds during summer are from East to S.E., and blow steadily, but from November to April they are generally from East to N.E., and are frequently interrupted by westerly winds and bad weather. The Company has discontinued loading vessels between the months of November and April.—*Commander Meade, U.S. ship Narragansett, 1872.*

HOWLAND or **Holland Island** was discovered by Capt. G. E. Netcher, in the *Isabella*, of Fairhaven, U.S., September 9th, 1842. It was afterwards several times reported by whalers in 1851 and 1858, and in the latter year by Capt. Paty, of the schooner *Liholiho*. On January 16th, 1859, Capt. Eldridge, of the American barque *Amazon*, announced it as a new discovery. Since that period it has been occupied by the American Guano Company. It will be needless to quote the numerous positions assigned to it; Commander Meade places its centre in about lat. 0° 49' N., long. 176° 40' W.*

The following description is principally by Capt. J. D. Hague, who came here in 1860, in search of guano. The island is about 2 miles long, N.N.W. and S.S.E., by half a mile wide, containing, above the crown of the beach, an area of some 400 acres. The highest point is about 20 ft. above the reef, and 10 or 12 ft. above the level of the high tide. Slightly brackish water is found by digging a few feet. A mooring-buoy was placed off the West side of the island, about 1½ cable from the beach.

The general features of the island resemble those of Baker or Enderbury Islands. Its surface, at least on the western side, is somewhat depressed, and

* *Fagin Islands*, reported by a whaler as in lat. 0° 46' N., long. 171° 59' W., and another island by the same authority, 35 miles to the southward, must refer to Howland and Baker Islands. The U.S. ship *Narragansett* passed over this position.

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THE GILBERT ARCHIPELAGO.

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much of it is covered by a growth of purslain, grass, and other vegetation, like that on Baker Island, but considerably more abundant. Near the centre are one or two thickets of leafless trees or brushwood, standing 8 or 10 ft. high, and occupying an area of several acres; the lower parts, near the roots, show signs of life after every rain. The windward side of the island is formed by a succession of ridges, composed of coral débris with some sand and shells, running parallel to the eastern beach, each one of which may, at earlier stages of the island's growth, have successively formed the weather shore. Occasionally among these ridges a sandy bed is met with in which some little guano is mixed. On the lee side there is also a sandy margin of considerable width. Bits of pumice and pieces of drift-wood are scattered all over the island's surface.

The main deposit of guano occupied the middle part of the island, and stretched, with some interruptions of intervening sand, nearly from the North to the South end. Its surface was even, and in many places covered by a thick growth of purslain. The deposit varied in depth from 6 inches to 4 feet.*

It is high water, on full and change, about 7^h 11^m; the rise is 8 ft. The tides are regular, and of the semi-diurnal type.

THE GILBERT ARCHIPELAGO.

Of this group the island first discovered was the easternmost, Byron Island, so named from the commander, who saw it June 3rd, 1765. The next were the northern groups, discovered by the ships *Scarborough* and *Charlotte*, commanded by Captains Marshall and Gilbert. There is a loose account of this discovery given in Governor Phillip's voyage, in 1788. The next authority in order is a chart contained in Dalrymple's collection, drawn by Roger Simpson

* DOUBTFUL ISLANDS.—The following announcements of discoveries hereabout, either require confirmation or do not exist:—

New Market Island, according to Mr. Consul Pritchard, of Apia, lies in lat. 0° 22' N., long. 174° 40' W. This must refer to Baker Island. A reef, by the same authority, lies in lat. 0° 21' N., long. 179° 20' W. A doubtful reef is placed 40 miles to the North of it on the charts. These must also refer to Baker and Howland Islands.

Starbuck Island, in lat. 0° 0', long. 178° 30', is perhaps intended for 173° 30' W., and refers to Hendersonville Island.

Phæbe Island, lat. 0° 20' N., long. 176° 40' W., cannot be found. Commander Sinclair, of the U.S. ship *Fandania*, could not find it; and Mr. Foster, mate of the *Jamaica*, who passed its reported position above twenty times between 1842 and 1844, never saw it. It is, therefore, probable that it is a transposition of Baker Island from West into East longitude. It was also searched for unsuccessfully by the *Narragansett*, in 0° 11' 11" N., 177° 18' W.

Mitchell Island, from whaler report, in lat. 9° 18' N., long. 175° 30' E., is believed not to exist.

An island, in 10° 0' N., long. 180° 0', and reefs in the same latitude, but in 179° 40' W., 179° 30' E., and 179° 15' E., from whaler report, if they exist, probably refer to the same.

and George Bass, officers of the *Nautilus*, under Capt. Bishop. In the Table of Positions, by John Purdy, is an account of some of the islands seen by the brig *Elizabeth*, about 1809. In 1824 Capt. Duperrey visited and explored many of them; but by far the most complete account of them is given in the account of the United States' Exploring Expedition. The ship *Peacock*, and her tender *Flying Fish*, surveyed the greater part of them. Additional information has been obtained from the reports of Lieut. Fenn, H.M.S. *Barrosa*, 1872; Lieut. Tanner, U.S. ship *Narragansett*, 1872; Commander Dupuis and Lieut. Browne, H.M.S. *Rosario*, 1874; Capt. Maxwell and Lieut. Stocker, H.M.S. *Emerald*, 1881; Capt. Bridge and Lieut. Ommaoney, H.M.S. *Espiègle*, 1883; and from other sources, British and foreign.

The name *Gilbert Archipelago* was given to the group by Admiral Krusenstern, after the commander of the *Charlotte*, one of the first explorers; the other commander's name being given to the group to the northward. Krusenstern separates them into three groups, the *Kingsmill Islands*, consisting of Bishop or Drummond Island and their subordinates; the *Simpson Group*, Woodle, Henderville, and Hopper, from the before-mentioned officers of the *Nautilus*; and the *Scarborough Range*, Marshall, Kroy, Matthew Islands, &c., from Capt. Gibbon's vessel. All these names seem to be very appropriate, and have been for many years acknowledged; we therefore follow them. On the other hand, in the American work they are all given under the collective title of the *Kingsmill Islands*; the name being only that of a small portion. From the account of the expedition we derive much of the following.

According to the information collected by Capt. Hudson and Mr. Hale, and furnished to Commodore Wilkes, the group consists of fifteen (or more properly sixteen) islands, ten of which were visited, the rest assumed from native information. The highest land of the group is not more than 20 ft. above the sea, and they are all of coral formation, having a general resemblance to the usual form of those islands. But it was found that, unlike those, many of the islands of this group afforded anchorage on their lee side on sand-banks; and in some of them the lee or western reef is wanting; this would form a distinctive character, and affords additional weight to the fact that the islands are fast wearing away by the action of the sea on them during westerly gales.* The compact coral shelf is found at the depth of 12 ft. beneath the surface. Another evidence of their decrease is, that in all cases where the island is at all exposed, it has become, as would be in such a case, a string of detached islets.

Their soil, which is but a few inches in depth, is of coral sand and vegetable mould, below which coral sand is to be found, and to this depth the wells and

* According to the evidence of a trader residing on Peru Island, the whole of that island is rising bodily, the elevation being estimated at 2 ft. during the four years of his residence there.—*Proceedings of the Royal Geographical Society*, November, 1884, p. 665.

taro patches extend. The rain-water percolates thus far, and meets the coral rock. Pieces of pumice are found, supposed to have been drifted on to it. The cultivation is chiefly cocoa-nut and pandanus, the chief articles of food. A species of taro (*Arum cordifolium*) is also grown with great care. On Makin or Pitt Island it is said that there is a trench, 10 ft. wide and not less than 7 miles long, dug around the lagoon, for the cultivation of this taro.

The Rev. L. H. Gulick, M.D., has given an excellent account of this and the neighbouring groups of *Micronesia*, which embraces the four archipelagoes of the Gilbert, Marshall, Caroline, and Ladrone Islands, and of their people. We derive many of the ensuing remarks from his lectures.

Since the visit of the United States' Exploring Expedition these islands have grown into some importance to the civilized world from their production of cocoa-nut oil. Very many sailors have at different times resided on shore—not an island of the group but has been thus thoroughly explored—and there are several who seem to have made their home there.

In November, 1857, a mission station was taken on Apaiang, or Charlotte Island, by the Rev. H. Bingham, Jr., and a Hawaiian associate. In September, 1860, a second station was taken by two Hawaiians on the neighbouring island of Tarawa. Since that time native teachers have visited the other islands. The language has been reduced to writing, and a number of children are fluent readers.

Nothing is more remarkable at the Gilbert Islands, to one who has visited other parts of *Micronesia*, than the great number of the people. Elsewhere the sparseness of the population is painful; but here the overflowing swarms are continually surprising one. Peru, one of the smallest of the atolls, has a population of from 1,500 to 2,000, and Aranuka has 1,000, while Taputeouea has from 7,000 to 8,000. In almost every other part of *Micronesia* the houses are scattered, and if there are what may be termed villages, they are but small collections of houses, and in no very close proximity to each other; while here the habit is to congregate in towns, where the houses are in nearly as close relation to each other as possible. These villages are—as is almost invariably the case on the low, annular islands—on the inner or lagoon shore, and as one lays at anchor within, the collections of low white-roofed houses, stretching along under the cocoa-nut groves, may be seen every few miles, the canoe sheds first, in a row along the beach, and then the dwellings, which are nothing more than roofs, standing promiscuously just behind, usually with a large council-house in the midst.

Capt. Randall, who resided here as a trader, estimated the population of the group at from 50,000 to 54,000, so that it contained more than half of the population of *Micronesia*, there being 20,000 to 25,000 on the Ladrone and Caroline Islands, and perhaps 10,000 on the Marshall Islands. As the area of the dry land is not more than 150 square miles, there will be from 300 to 350

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persons per square mile, a density scarcely equalled in the world. Many cruelties have been perpetrated on these people by vessels engaged in "kidnapping" labourers for sugar-plantations, &c., and there is no doubt that many of the reported outrages on merchant vessels have arisen from this cause.

In physical appearance this people are darker and coarser as a whole than the more western inhabitants of Micronesia. They are also a larger race, some of the chiefs being very corpulent, equalling in size the ancient chiefs of Hawaii. This is also the more remarkable from these islands being the most barren of the atolls of Micronesia. The cocoa-nut and the pandanus, and a few laboriously-cultivated taro, are the only vegetable productions, while the greater number of the low islands of the Marshall and Caroline Archipelagoes produce taro, bread-fruit, and jack-fruit in considerable abundance.

The usual height is about 5 feet 8 or 9 inches, but we saw many who were considerably below this standard. There are none of those burly persons among them which are so common in the Sandwich and Society Islands, and we did not see one instance of obesity.—*Mr. Hale.*

The food of these people, besides the plants mentioned, consists of all kinds of fish, from the whale to the sea-slug. Great numbers of fish are taken in weirs on the coral flats. Turtle are taken in the season on the beaches; and shell-fish, with the sea-slug or biche-de-mar, are obtained by diving. Whales are said to have been formerly much more numerous than now. They then sometimes got aground and were taken. Now a carcass occasionally drifts on shore.

There is not much to induce general trading vessels to come here; they possess but little in the way of refreshment, and there is neither wood nor water in any quantity. They are only visited by small schooners in search of emigrants, and for cocoa-nut oil. They possess many good harbours, a rare advantage in low coral islands.

Too much reliance should not be placed on the information received from trading vessels as to anchorages in this group, as they frequently anchor close to the reefs, and trust to the wind remaining in the same direction to keep them off it.—*H.M.S. Espiègle.*

The Climate of these islands is equable, and though of high temperature it is found to be less oppressive than in most tropical countries. For the most part constant breezes prevail, and frequent rain falls, which moderates the great heat, and at the same time confers fertility on the soil. From October to April, the time of the *Peacock's* visit, is the winter, and is especially distinguished by the frequency of rains. Variable winds from the northward and westward prevail at this season, and they have violent gales from the S.W.; these, according to Kirby (who was taken off the islands), are typhoon-like. The natives plant stakes to prop up their houses, and tie them down, to prevent them from being blown away. These storms last three or four days, veering gradually round to the North. The leeward sides of the islands receive most

the world. Many engaged in "kidnaping" without doubt that many of them are guilty of this cause.

As a whole than the larger race, some of the ancient chiefs of the islands being the most warlike, and a few of the greater archipelagoes produce

by many who were of the burly persons of the Society Islands, and

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high temperature it is. For the most part the climate moderates the heat.

From October to March, especially distinguished by the northward and southward winds from the S.W.; these are typhoon-like. It is down, to prevent the sun from scorching the days, veering winds receive most

damage, and both land and trees are swept away. Kirby stated that, during his residence, the lee side of Kuria had worn away. In these gales, the trunks of large trees are thrown on the West side of the island, together with large lumps of resin, similar to that found on the soil at New Zealand, which the natives use to scent their oils with. These trees, sometimes 2 ft. in diameter, were thought to be of the pine species. Many stones are found in their roots, from 8 to 10 inches in diameter. These are a fine basalt, and the natives use them for various purposes.

From May till September the weather is fine, with clear skies, and only occasional showers; and during this time the trade wind blows constantly from the eastward, with intervals of calm. This is the season in which the natives make their voyages; they never venture abroad in the winter months, even from island to island, being well aware of the danger of so doing.

Currents.—The Gilbert Archipelago lies near the northern limit of the South Equatorial Current, which generally runs to the westward. Off Tamana it has been experienced running 2 knots an hour to W.S.W. H.M.S. *Espiègle* found that the current, which was westerly in the southern part of the group, began to set to the northward and eastward North of Apamama, running to the eastward off the North point of Maraki at the rate of three-quarters of a mile an hour.

Tides.—It is high water throughout the group, on full and change, at 4^h; springs rise about 6 ft.

Earthquakes are occasionally experienced in these islands. Kirby stated that during the three years he was on Kuria, or Woodlee Island, he had felt ten or twelve, sufficiently severe to shake down a house. The natives exhibit no fear on account of them. The direction of the oscillations seems to be from the S.W.

The following account begins with the southernmost of the archipelago, and proceeds northward. As the relative positions of the islands have not been accurately determined, the positions here given must only be considered as approximate.

ARURAI, Arore, or Hurd Island, is the southernmost of the group. It was discovered in the *Elizabeth*, prior to 1810, and was then named *Hope Island*. "But," says Mr. Purdy, "there being another Hope Island at about 14° distant to the northward of the Equator, I have substituted Hurd Island on the chart, from respect to Captain Hurd, of the Navy, hydrographer to the Admiralty."

The following account is taken principally from that of M. Dutailis. It is low and well wooded, and perhaps may be seen at 10 miles off. Its length is 6 or 7 miles, and its breadth 1 or 1½ mile, but landing can only be effected on the West side. Breakers extend 3 cables from the South point.

The sea breaks heavily on the shore to the East. At the North point of the island there is a bank of sand, with some rocks interspersed, on which there is

but $3\frac{1}{2}$ fathoms. It is all the more dangerous because the sea does not always break on it. Its extent is about 4 miles, and its direction is determined by the angles comprised between N.N.E. and E.N.E., of which the North point is the summit. In a sketch by Capt. Peters, 1875, this bank is shown as extending 2 miles N.N.W. from the North point.

Off its West side whalers and small vessels have anchored off the reef in 25 fathoms, but so close that a shift of wind to the southward or westward renders the position most dangerous.

The island has 2,000 to 2,500 inhabitants. They are completely naked. Their canoes, formed from a vast number of pieces, are clinker built, and are most graceful in form. Fish, poultry, cocoa-nuts, &c., are easily procured in exchange for tobacco. A missionary was stationed here in 1870.

According to M. Dutailis, the South point is in lat. $2^{\circ} 40' 54''$ S., long. $177^{\circ} 1' 13''$ E.; North point, lat. $2^{\circ} 37' 24''$, long. $176^{\circ} 56' 57''$. These results are nearly identical with those assumed by Mr. Purdy, but later observations place them 7' farther to the eastward.

NUKUNAU, or *Byron Island*, was discovered by Commodore Byron, July 2, 1765. He describes it as a low, flat island, of a most delightful appearance, and full of wood, among which the cocoa-nut was very conspicuous. He saw, however, to his great regret, much foul ground about it, upon which the sea broke with a dreadful surf. He sailed along the S.W. side.

It is of low coral formation, surrounded by a reef, and is 8 miles in length, N.W. by N. and S.E. by S., and a quarter to $1\frac{1}{2}$ mile in width. It is thickly covered with cocoa-nut and pandanus trees, which can be seen 12 miles from the deck. The island appears as three islands from a distance, in consequence of the centre being low and sandy with a large clump of trees on it. There is anchorage along the S.W. side, and in 14 fathoms, sand and coral, close under the S.E. point, the bank being steep; this anchorage is impracticable except with a northerly or easterly wind. It is stated that there is no anchorage fit for a large vessel. Landing is difficult except at high water. In 1872 the population was about 5,000.

The S.E. point of Nukunau is placed by Commander Meade, U.S. ship *Narragansett*, in lat. $1^{\circ} 23' 42''$ S., long. $176^{\circ} 34' 51''$ E.; later observations place it 4' more to the eastward.

PERU, or *Francis Island*, is also called *Peroat*, *Maria*, and *Eliza Island*, on former charts. It was discovered by Captain Clerk, of the ship *John Palmer*, in 1827. It is 11 miles in length, N.W. by N. and S.E. by S., from one half to $1\frac{1}{2}$ mile in width, 6 to 8 ft. in height, and thickly covered with cocoa-nut and pandanus trees; it is surrounded by the usual reef, and has an extensive lagoon on the S.W. side, which can only be entered by boats at high water. About the centre of the island the reef extends $2\frac{1}{2}$ or 3 miles westward from the land; it also extends 2 miles off the N.W. point, and about half a mile off the S.E. point. In 1872 the population was about 2,000. This island, as

well as Byron Island, has a Samoan teacher belonging to the London Missionary Society.

There is anchorage on the West side of this island, to the northward of the most western point of the reef, in from 5 to 7 fathoms, about $1\frac{1}{2}$ cable from the reef, with the N.W. point of the island bearing N.W. by N. $\frac{1}{2}$ N., and the S.W. point E. by S. $\frac{1}{2}$ S. The bank is very steep, and coming from the southward care must be taken to avoid a shoal running out from the West point of the reef. The South point of Peru is in lat. $1^{\circ} 27' 30''$ S., long. $175^{\circ} 59' E.$

ONOATOA, Onutu, or *Clerk Island*, is described by the Rev. Mr. Bingham as some 12 miles in length, having a lagoon bordered by a reef on the western side, with a good boat channel near the centre. He says the *Morning Star* anchored on the extreme western part of the reef, some 6 miles from the main land, but they afterwards learned that there was good anchorage in a bay on the N.W. side much nearer the land. This agrees with the description given by Capt. Peters, in 1875. The natives are a tall fine-looking race; the officers of H.M.S. *Barrosa* found them very friendly, but they are often fighting among themselves. They are stated to number about 3,000. A native teacher was left here in 1870.

H.M.S. *Emerald* anchored in 16 fathoms, about 2 cables from the reef on the N.W. side of the island, with Teumah Islet bearing N. by E. $\frac{1}{2}$ E., distant one-third of a mile, but found hardly room enough to swing. Boats can enter the shallow lagoon. Teumah, at the N.W. extremity of Onoatua, is in lat. $1^{\circ} 53' S.$, long. $175^{\circ} 30' E.$

TAMANA, or *Rotcher Island*, is about 3 miles long and three-quarters of a mile broad, having a fringing reef extending about half a mile from the North and South extremes, and from the coast on the eastern side; on the S.W. or lee side there is deep water close to the shore, and there are no off-lying dangers. The western shore forms a bight about half a mile deep, but there is no anchorage. According to observations made on H.M.S. *Emerald*, the approximate position of its South extreme is lat. $2^{\circ} 32' S.$, long. $175^{\circ} 55' E.$

The Rev. S. J. Whitmee states that the island is well supplied with cocoa-nut palms and pandanus. Good water is procured in abundance by sinking wells near the centre. There were three European traders here, and a teacher was landed.—(*Mercantile Marine Magazine*, January, 1872, pp. 14—18.)

TAPUTEUEA, or *Bishop* or *Drummond Island*.—This extensive island, or group of islets, had the second of the foregoing names applied to it by Adm. Krusenstern, from the commander of the vessel, the *Nautilus*, who is presumed to have discovered it. In the chart drawn up from that voyage, the only island named is *Drummond Island*; it is there shown as 26 miles long, the whole length lined with rocks and reefs, outside of which the *Nautilus* anchored in 18 fathoms. At 5 miles to the West of this reef is another, shown separately on the chart under the name of the *Nautilus Shoal*, near which the vessel

passed. Both of these were examined by Capt. Duperrey, in 1824. But the fullest account is that given in Capt. Wilkes's Narrative.

It was made by the U.S. Exploring ships *Peacock* and *Flying Fish*, April 3, 1841, and they here encountered the regular N.E. trades. It is of coral formation, 30 miles long, N.W. by W. and S.E. by E., and varies in width from half to three-quarters of a mile. This, however, only includes the high portions, or that which is a few feet above the ocean level. It is thinly covered with cocoa-nut and pandanus trees, and not a patch of grass was to be seen, nor any sort of shrubbery or undergrowth. To leeward, or on its West side, the reefs and sand-banks extend some distance off, gradually increasing from the N.W. point to the S.E., where they are as much as $6\frac{1}{2}$ miles in width. This reef is interrupted in many places, and there is good anchorage off the town of *Utiroa*, towards the N.E. end, near a small sand-bank, which is usually bare; this is now known as *Peacock Anchorage*. The whole shore of the island, as the *Peacock* approached it, appeared covered with houses, presenting to the view one continuous village. At intervals of a mile there were buildings of huge proportions, far exceeding in size any they had before met with.

The natives of this island are totally different to those on the islands to the South. They are middle-sized, slender, and well proportioned; their colour a shade or two darker than that of the Tahitians, and they exhibited a greater variety of face and features, with black glossy hair, finer than in other races. Their features are small, but high and well marked, their cheek-bones projecting, and they are the only natives in the Pacific that have the defect of decayed teeth. Altogether they were thought to resemble the Malays. The majority of them go entirely naked, except a conical covering for the head of plaited and bleached pandanus leaf. They exhibited many bodily traces of their warlike dispositions in their numerous scars and wounds. In order to guard against the destructive effect of their formidable shark's-teeth swords and spears, they have invented an effective kind of armour, a sort of cuirass of plaited cocoa-nut fibres, as solid and compact as a board, and half an inch thick. This rises, like a high-backed chair, 3 or 4 inches above the head. They also draw on more flexible coverings for the legs and arms. Their head dress is still more singular, the skin of a porcupine fish cut open at the mouth to fit the head. They were extravagantly fond of tobacco. Their canoes were different to the other islanders, averaging 12 or 15 ft. long, 2 to 3 ft. deep, and from 15 inches to 2 feet wide; they are well modelled, built in frames, and have much sheer; they are formed of cocoa-nut tree boards, sewn neatly together, and use an outrigger, though much smaller than usual; one of the sides is nearly flat, and in this respect they resemble the Ladrone proa figured in Anson's voyages.

In Capt. Wilkes's narrative they were much incommoded by the insolence and rudeness of the people, and one of the men having been decoyed away or murdered, the ship's party burnt the town of *Utiroa*.

Capt. Randall estimates the population at from 7,000 to 8,000, which will

give this small strip of land as great, if not a greater, number of inhabitants to the square mile than any portion of the globe that relies upon its own resources for subsistence.

No land-birds were seen but curlews, golden plovers, turnstones, noddies, and white terns; many whales' bones were strowed over the beach. This was the first place where they had observed the shells of the *Tridachna gigas*, the gigantic cockle; they were of enormous size; the natives used them for troughs for many purposes around their houses.

There is neither wood nor water to be obtained at this island, and no inducement to visit it, except to trade for cocoa-nuts.

Good whaling ground exists in the vicinity, and the American whalers are in the habit of cruising in this neighbourhood. Those who visit these people ought to keep a constant guard against treachery, for their numbers are large, and they are prone to mischief. All intercourse with them should therefore be conducted with great caution, especially in ships weakly manned.

Peacock Anchorage is in a bay formed by the reef, at about 6 miles southward of the North end of the island, having depths of 5 to 30 fathoms, broken coral bottom, smooth and safe, except with winds from the southward and westward. A long flat, scarcely covered at low water, and with heavy rollers over it at high water, makes communication with the shore difficult. It is high water, on full and change, at 6^h 15^m; the flood stream sets to the southward.

Vessels can anchor in 7 fathoms, with the sand-bank near the extremity of the southern reef, only covered at high water springs, bearing S.E. by E. $\frac{1}{4}$ E., distant about $1\frac{1}{2}$ mile, and Utiroa village about E. by N. $\frac{1}{4}$ N. Vessels are recommended to anchor in not less than 17 fathoms; this enables a ship to stand clear of the North reef to sea, in case the wind should shift to the westward. In approaching from the southward, vessels should not stand in until the North point of the islands is recognised; the reef should not be approached within 3 miles, on account of outlying coral heads, and a good look-out from aloft is indispensable. As there are several villages opposite the anchorage, the village of Utiroa cannot be considered a good mark for it. In coming from the northward, after rounding the North point, about a mile distant from the reef, steer to the southward until the first gap between the islands bears about E. by S. $\frac{1}{4}$ S., then steer for it, keeping a good look-out from aloft to clear the point of the northern reef.

Great care must be taken in coming to an anchor here, as the water shoals very quickly.

The reef off the S.E. point of Drummond Island is stated to extend 12 miles to the southward, and is very dangerous, several vessels having been lost on it. The S.E. point of the island is in lat. $1^{\circ} 27' 30''$ S., long. $174^{\circ} 59' 30''$ E.; the North point is in lat. $1^{\circ} 8'$, long. $174^{\circ} 37' 30''$.

NANOUTI, Nonouti, or *Sydenham Island*, is one of the early discoveries in

the group. In the chart drawn up by Roger Simpson and George Bass, of the ship *Nautilus*, given in Dalrymple's Collection, it was composed of *Dog Island* and five smaller islands, separated by a considerable reef. On the original chart above mentioned, the S.W. of these islets is called *Two-tree Island*, and the West point of Dog Island is called *Cape Morai*. It was examined by Capt. Duperrey in his voyage of discovery in 1824. In the Table of Positions by Mr. Purdy there is an account of the discovery by the brig *Elizabeth* of *Blaney Island*, "long, low, and abundantly supplied with cocoa-nut trees." All these observations give place to those of the U.S. Exploring Expedition, in which, however, the error is committed of stating it to be the same as the Bishop's Island "of the charts."

It is of coral formation, and a mere ledge of land like Drummond Island, with a lagoon, reef, and a bank on its lee or S.W. side. By Captain Hudson's survey it is 19 miles long, trending N.W. and S.E., and its width, including lagoon and reef, $8\frac{1}{2}$ miles. On its S.W. and N.W. portions there is a coral bank, from 1 to $1\frac{1}{2}$ mile beyond the reef, on which there is 10 fathoms water. At the distance of 4 miles from the N.W. end of the island they found soundings in 265 fathoms.

The island is partially covered with cocoa-nut, pandanus, and other trees; and the islets of which it is formed are nearly continuous, connected by the usual coral reef. They had no communication with the natives, but a daily intercourse is kept up between them and the Drummond islanders. It was thought there was no difference in their characters. The distance between them is 27 miles. The population is estimated at 6,000, the island being overpopulated.* Trading-vessels anchor along the S.W. side of the reef. There is reported to be anchorage in 7 to 10 fathoms, about 4 miles south-westward of the N.W. extremity of the island, off a small sand islet, also in 10 fathoms, 2 miles W.N.W. of the S.E. point. H.M.S. *Emerald* found good anchorage north-westward of the S.E. extreme in 17 fathoms, over coral, sand, and shells, at about 1 cable from the reef. A passage is said to exist into the lagoon through the reefs immediately eastward of the fishing huts marked on the Admiralty chart. In 1876 a white man was living on the southern islet. The South extremity is in lat. $0^{\circ} 45' 30''$ S., long. $174^{\circ} 22' 30''$ E.; the North island is in lat. $0^{\circ} 30'$, long. $174^{\circ} 12'$.

ARANUKA, Nanouki, or *Henderville Island*, was discovered by Captains Marshall and Gilbert, and was also examined by Captain Duperrey, in 1824.

* From the North point of this island there was a small island in sight, which was at first supposed to be Duperrey's Ile du Nord; but if it be, instead of being located to the northward, as he has placed it, it bears nearly South of the North extreme of Nanouti. They found, on proceeding towards it, that it was a hummock connected by a reef with Nanouti; but no Sable Island could be seen. The tender passed round the opposite side of Nanouti, and did not see any island; and the officers of both vessels were fully convinced that no Sable Island exists.

It was surveyed by the U.S. Exploring Expedition. It is $6\frac{1}{2}$ miles long, East and West, and $5\frac{1}{2}$ miles wide at the East end, diminishing to 2 miles at the West end; it is of coral formation, enclosing a lagoon. A rocky bank of 7 to 10 fathoms extends off the West and N.W. sides. There are two towns on the West end, and several on the East and S.E. parts, and it is thickly inhabited. The natives who came on board the *Peacock* said that the two ends of the island were at war with each other. They are very much the same in appearance as the natives of Drummond Island; were naked, and spoke the same dialect. This island affords neither wood, water, nor refreshments. From appearances, its inhabitants (about 1,000) must be at times much stinted for food. The South point is in lat. $0^{\circ} 8' 30''$ N., long. $173^{\circ} 32' 15''$ E.

KURIA, or *Woodle Island*, was, with Hopper and Henderville Islands, one of the first discoveries in the group, by Capts. Marshall and Gilbert. It was surveyed by the U.S. Exploring Expedition. Its greatest length is 5 miles, N.W. and S.E., and its greatest width, which is at its S.E. end, is $2\frac{1}{2}$ miles. The remainder is very narrow, and almost divided towards the centre. The N.W. portion, named Oneaka, has two small lagoons, 200 or 300 yards from the beach; the water in them is not so salt as the ocean. In one of them the bottom consists of red mud on one side, while it is white clay on the other. They are used as fish-ponds by the chiefs. There is a reef extending to the N.W., nearly 3 miles.

The island is but partially clothed with trees, consisting of cocoa-nut, pandanus, and a few stunted bread-fruit. It has no outer reef, and may be approached very closely, but it affords neither wood, water, nor refreshments. The present population is about 1,500, not more than one-third of the estimate of 1841. The *Peacock* took off an Irishman, John Kirby, a deserter from an English whaler, who had not been roasted and eaten on his landing, but had had the chief's daughter given him as his wife. He had thus dwelt as one of them from February 11, 1838, to April 15, 1841. He said that the natives, though not professed cannibals, sometimes ate human flesh; but their food is generally fish.

APAMAMA, *Roger Simpson*, or *Hopper Island*, was one of the discoveries of Capts. Marshall and Gilbert, in the *Scarborough* and *Charlotte*, as related in the voyage of Governor Phillip, 1788. It was not seen by Capt. Duperrey. The latter commander believed it to be identical with the *Dundas Island* of the brig *Elizabeth*, 1809. It must also be considered to be beyond doubt the same as the *Roger Simpson Island*, discovered by Capt. Bishop in the *Nautilus*. A survey was made of it in the U.S. ship *Peacock*, in 1841.

The islands, which are about 5 ft. above the surface of the ocean, lie on a reef 10 miles long, N.W. and S.E., and 5 miles in width. The land is continuous on the North and East sides, excepting two small strips of bare reef. There is anchorage on the West side, in an opening between the reef and the N.W.

North Pacific.

point of the island, which is about 2 miles wide. The soundings vary from 2 to 5 fathoms; across it, in some places, the bottom is broken coral, in others coral sand. The entrance to the lagoon, although feasible, should not be attempted through this passage; but there is a good passage into it on the South side of the island, which is a mile wide. It has a large population (about 5,000), but yields little more than will supply their wants. A small quantity of fresh water may be had by digging on the beaches; wood and refreshments are not procurable for shipping.

The chief, who also controls Kuria and Aranuka Islands, resides on the largest island, about $2\frac{1}{2}$ miles N.W. of its S.E. end, and there is also a German trading-store here. Vessels can only trade with the natives by permission of the king.

The southern passage into the lagoon may be readily recognised by Entrance Island, which forms its eastern side. It is 3 cables wide, with an average depth of $5\frac{1}{2}$ fathoms, having some knolls of 8 ft. to $3\frac{1}{2}$ fathoms in it. Upon the ebb tide the water is much discoloured. Northward of Entrance Island the channel is contracted to 1 cable in width, and carries $3\frac{1}{2}$ fathoms, again deepening and widening into the lagoon. It is high water, on full and change, at $4^h 30^m$; springs rise 6 ft. The ebb runs 4 knots an hour. Vessels drawing 14 ft. go in with the assistance of native pilots. There is anchorage in 6 fathoms, with the centre of Entrance Islet bearing S.W. by W., half a mile from the reef. The W. end of Entrance Islet is in lat. $0^{\circ} 23' 30''$ N., long. $173^{\circ} 47' 45''$ E.

MAIANA, or *Hall Island*.—The name of Hall has been applied to this island both by Duperrey and by the American Expedition, though there is great reason to believe that it was previously seen by the original discoverers of the group, and then named *Gilbert Island*. The name, Hall Island, was given by the commander of the brig *Elizabeth*, in about 1809. If so, it ought to be called Gilbert Island, and the other name has been dropped by Admiral Krusenstern, who reasoned from the imperfect data then in existence.

Capt. Hudson gives the following account from his survey of it:—

It is of coral formation; the N.E. and S.E. parts are a continuous land, whilst to the S.W. and N.W. it consists of a reef and bank, in some places awash, with a sand-spit in its lagoon. The western sides of the island are, therefore, very dangerous, and should be approached with caution, as the sea seldom breaks on them, and the discolouration of the water is not at all times to be observed. The population is about 4,000, but it affords neither refreshment, wood, nor water. It is 9 miles in length, N.E. and S.W., and 6 miles broad. On its West side, on some of the banks, there is anchorage in 10 to 15 fathoms. Its South end is in lat. $0^{\circ} 51' 30''$ N., long. $172^{\circ} 55' 30''$ E.; its North end is in lat. $1^{\circ} 2'$, long. $172^{\circ} 56'$.

There are two German stores here, one near the North end, and the other

near the South end. Anchoring ground is reported about 1 mile S.W. of the North extremity.

TARAWA, *Cook*, or *Knoy Island*.*—In this island there has been very considerable confusion of names. Knoy Island was discovered in the *Seaborough* and *Charlotte*. A portion (probably) was named *Marshall Island*. Captain Duperrey takes no notice of this name, but applies the name of *Gilbert Island* to it. In the periodical publications of 1810 there appeared an account of the situation of the islands seen by the brig *Elizabeth*. It was presumed to be in the year 1809, but our chart says 1804. The extracts have been preserved by Mr. Purdy, in his Tables. In that work there is an account of the discovery of an island, which was named *Cook's Isle*, the account of which agrees perfectly with that of the South side of Knoy Island, now under consideration. There is no doubt of their identity. It may be assumed, then, that Knoy, Cook, and Marshall Island are meant for the same.

It was surveyed in 1841 by the U.S. Exploring Expedition. It is of coral formation, 20 miles in length, N.W. and S.E. On its East and S.E. sides the land is continuous and wooded, with the exception of four gaps, where the reef is bare. The South side is 12 miles long, and trends nearly East and West. On this part, near the West end, are three hummocks (which appear like islands in the distance), and several small sand-banks, which are connected by the same reef. The island has its lagoon, but it has the appearance of being an extensive bay, in consequence of the reef on the West side being a sunken one, on which is found 5 fathoms of water.

This island is partially wooded, having several groves of cocoa-nut trees on it, and a dense undergrowth. Several towns were seen on it, and it appeared to be thickly inhabited. It affords no supplies for vessels. The natives, about 3,000 in number, are entirely the same in appearance, in character, and customs, with the rest; they go naked, and speak the same dialect. They should not be trusted. No supplies or water could be obtained here.

There is a German trading store 2 miles N.W. of the S.E. extremity, and about 5 miles westward of it is a small sandy islet, with a few cocoa-nut and pandanus trees on it, lying in the lagoon. Vessels entering bring this islet to bear between East and E. by S. $\frac{1}{2}$ S. H.M.S. *Rosario* entered on the latter bearing, and her officers recommend that, to avoid the numerous shoals, a vessel should steer to the southward, keeping close along the inside of the South reef in not less than 6 fathoms. H.M.S. *Blanche* entered on an East bearing, and the lagoon was tolerably clear of shoals as far as a line of sand-banks extending North and South from the sandy islet; passing between two of these shoals southward of the island in 4 fathoms, the *Blanche* anchored in 9 fathoms about 1 mile eastward of the islet, shut in by sand-banks in every

* *Knoy Island* in the American work, which is a perversion. It is *Knoy Island* in the original.

direction. H.M.S. *Emerald* anchored inside, off the S.W. inlet; trading vessels anchor about $1\frac{1}{2}$ mile westward of the trading store.

There is also fair anchorage at the North end of Tarawa, off a small islet on the reef. The North extremity of Tarawa is in lat. $1^{\circ} 39' N.$, long. $172^{\circ} 54' 30'' E.$; the S.E. end is in lat. $1^{\circ} 22' 15''$, long. $173^{\circ} 4' 30''$.

APAIANG, *Apia*, or *Charlotte Island*.—The latter name was applied to this collection of islets by Adm. Krusenstern, from the idea that the term, *The Six Islands*, was applied by their discoverer, Capt. Marshall, in the *Charlotte*. In the original charts the names of these six islands were given as *Marshall*, *Allen*, *Gillespy*, *Clerk*, *Smith*, and *Scarborough*; but they all lie in one reef, so must be taken as one. They were not seen by subsequent navigators, particularly by Duperrey, who would have cleared up the discrepancy. The U.S. Expedition surveyed it in 1841, and the *Narragansett* visited it in 1872.

It is a lagoon island, consisting of a string of coral islets, situated within a reef, which is 6 or 7 ft. above the water. The reef has a bluff front, and is much worn by the sea. Its length, in a N.W. and S.E. direction, is 16 miles, and its average breadth 6 miles. On the East side the land is covered with cocoa-nut and pandanus groves, with some undergrowth. The N.W. and West side is a continuous reef, with many islets on it. There is no island in the lagoon, as shown in the French chart of Duperrey. The population is about 3,000, and there is a mission station here. Small quantities of fowls and pigs can be obtained, and fish is plentiful. The water is brackish.

There are two ship channels and two boat passages into the lagoon, all on the S.W. side. The N.W. passage is near the centre, about three-quarters of a mile N.W. by N. from a thickly-wooded islet; the channel is from 1 to 2 cables wide, with $2\frac{1}{2}$ to 5 fathoms. There is good anchorage outside this channel in 6 to 8 fathoms, sandy bottom. This passage is used principally by traders going out, as they have a fair wind through it. *Bingham Passage* is the main ship channel, and is used by all vessels entering the lagoon; it is $1\frac{1}{2}$ mile south-eastward of a small white sand-bank with a single tree on it. It is about 200 yards wide, with $2\frac{1}{2}$ to 5 fathoms water. The deepest part of the channel is on the eastern side. There is good anchorage both outside and inside this passage, in 8 to 12 fathoms, sand and coral bottom. There are numerous coral patches between this passage and the mission station, off which there is anchorage, but they are easily avoided.

There is a German trading store about 7 miles northward of the S.E. point. The North point of this group is in lat. $1^{\circ} 58' N.$, long. $172^{\circ} 50' 30'' E.$; the S.E. point is in lat. $1^{\circ} 44' 30''$, long. $172^{\circ} 59'$.

MARAKI, or *Matthew Island*, was also one of the original discoveries by Capt. Marshall and Gilbert, in 1788. It is much smaller than either Tarawa or Apniang, and is a lagoon island, of coral formation. It is but 5 miles long, N. by E. and S. by W., and $2\frac{1}{2}$ miles wide at its base, being of a triangular shape. It appeared to be densely peopled, for many villages were seen. Capt.

Randall estimated the population at 2,000. Their dialect and customs were the same as the rest of the group.

The principal village is on the West side, about $1\frac{1}{2}$ mile southward of the North point, off which there is reported to be anchorage, but H.M.S. *Espiègle* could find none. There is a German trading store here. There is also reported to be a boat passage into the lagoon, about 2 miles northward of the S.W. end. The North end of Maraki is in lat. $2^{\circ} 3' N.$, long. $173^{\circ} 17' 30'' E.$

Of the discovery of Taritari and Makin Islands there appears to be no exact record. They were not seen by Marshall and Gilbert, nor by Duperrey; but they were placed too far to the East on the chart. The name of Touching Island is given to Taritari, the westernmost island, on Arrowsmith's chart. They were examined by Capt. Hudson, of the U.S. Exploring ship *Peacock*.

TARITARI, *Dutaritari*, or *Touching Island*, is somewhat of the figure of a triangle, with its apex to the South, and its sides are above 14 miles in length. The S.E. side is an almost continuous grove of cocoa-nut and pandanus, with some undergrowth, and about 4 miles N.E. of the S.W. point is a German trading store. On the two other sides is a reef, which is awash, excepting the N.W. point, in which there is a small boat inlet. The population was about 1,500 in 1874; they appeared well disposed, civil, and more settled than on any other of the group. The chief resides at Makin. There are several lakes or lagoons of fresh water on the island.

The entrances to the lagoon lie close together, near the centre of the West side. The northern one has a depth of 6 fathoms, but the southern entrance is the best, being about 4 cables wide with a least depth of 9 fathoms between the reefs. There is a white house on a small island near the entrance. There are numerous shoal patches inside the lagoon, all easily avoided. The course in is about N.E. until inside all the shoals, then bring a conspicuous large hut to bear S.E. by S. $\frac{3}{4}$ S., which will lead to the anchorage in 13 fathoms, which is off a large village. H.M.S. *Rosario* found the bottom very uneven.

The S.W. point of Taritari is in lat. $3^{\circ} 1' 30'' N.$, long. $172^{\circ} 46' 15'' E.$; the North point is in lat. $3^{\circ} 14'$, long. $172^{\circ} 41'$.

MAKIN, or *Pitt Island*, is of much smaller dimensions, being but 6 miles long, N.N.E. and S.S.W., and from half a mile to 2 miles in width. Its N.E. point lies in lat. $3^{\circ} 20' 45'' N.$, long. $172^{\circ} 58' 45'' E.$ This small island is the seat of government, and the natives now unite both names under the one of Makin. When the *Peacock* approached, above twenty canoes came off, with from five to ten natives in each; in one of them was a white man, Robert Wood or Grey, who had been left on the island by an English whaler, at his own request, seven years before. Dr. Gulick estimated the population at 500. There is no anchorage here.

Paanopa, *Banaba*, or *Ocean Island*, in lat. $0^{\circ} 52' S.$, long. $168^{\circ} 24' 25'' E.$,

(Dutailis), is considered as a part of the Gilbert Islands, but is described in our South Pacific Directory.

Nawodo, *Onavero*, or *Pleasant Island*, is also included in the Gilbert Archipelago, but it is far to leeward. Capt. Cheyne places it in lat. $0^{\circ} 25' S.$, long. $167^{\circ} 5' E.$ It is also described in the South Pacific Directory.

THE MARSHALL ARCHIPELAGO.

This extensive collection of islands lies between lat. $4^{\circ} 30' N.$ and $12^{\circ} 30' N.$, and is separated from the Gilbert Islands by a channel 160 miles broad. The Rev. Dr. L. H. Gulick has devoted much attention to this group, as well as to the other islands of Micronesia, and his nomenclature will be followed hereafter. The spelling of the native names is that adopted by the Micronesian Mission—the system of Lepius. He considers that it is almost certain that Alvaro de Saavedra visited both chains in 1529. More than two centuries elapsed before they were again visited, as far as is known. Captain Wallis visited what are now known as the Rongerik Islands in 1767.

But the most important of the early voyages is that of 1781, by Captains Marshall and Gilbert, of the English Navy, in the ships *Scarborough* and *Charlotte*, bound from Port Jackson to China, which voyage originated in the first colonization of Australia. As Captain Marshall was the principal officer of the expedition, his name has been applied to the whole archipelago by Krusenstern and others; that of Capt. Gilbert has been given to that to the southward. There is considerable confusion in the original accounts, Captain Gilbert having named some of the islands already named by Capt. Marshall; and Capt. Bishop, who ten years later discovered some of them, also named them, which caused great difficulties in the nomenclature, which were not decreased by the great discrepancies between the respective longitudes given by these officers.

Besides the discoveries of Capt. Marshall, there is another range of islands, the Ralik chain, occupying the same extent of latitude, within 3 degrees to the westward of them, discovered by various navigators proceeding to India.

In May, 1816, Kotzebue first saw the closely-connected groups of Taka and Utirik, while on his way to the North. In January succeeding, after recruiting at the Sandwich Islands, he again visited this region, and discovered and thoroughly explored the greater number of the Ratak Islands. In October of the same year he again returned directly from the North to these islands, and added still another group to his discoveries, so leaving only the three southern atolls of the range unexplored. In October, 1825, on his second voyage, he again visited these islands, and added to his former explorations the four most northern groups of the Ratak Islands, the most eastern and western of which may be called discoveries, though he made most singular and confusing mis-

takes in giving native names, mistakes never before noticed, and which long perplexed Dr. Gulick.

In 1792 Capt. Bond discovered two of the Ralik Islands, and in 1797 Capt. Dermott another. In 1804, the English ship *Ocean*, and again in 1809 the brig *Elizabeth*, saw several of the middle Ratak Islands. But of all others, the most important name connected with the Marshall Islands is that of Kotzebue, of the Russian Navy.

After Kotzebue, Capt. Duperrey determined one group in 1824; since which they have been visited by Capt. Hagemeister, in 1831; by Captains Chramtschenko and Schanz, of the Russian Navy, in 1829, 1832, and 1835; by the U.S. Exploring Expedition, in 1840; and Capt. Cheyne, in 1845.

Several other visits to the different islands are also noticed by Dr. Gulick, a most important event being the establishment of the Mission under Dr. Pierson, in Kusaie, in 1855, which was subsequently removed to Ebon, where it still remains under the charge of the Rev. Mr. Doane.

We are also much indebted for more accurate accounts of these islands to the reports of Lieut. Fenn, H.M.S. *Barrosa*, 1872; Lieut. Tanner, U.S. ship *Narragansett*, 1872; Commander Dupuis and Lieut. Browne, H.M.S. *Rosario*, 1874; Mr. J. Bray, master of the Missionary vessel *Morning Star*, 1880; Capt. Maxwell and Lieut. Stocker, H.M.S. *Herald*, 1881; Capt. Bridge and Lieut. Ommanney, H.M.S. *Espiègle*, 1883; and of others, including those of the German corvettes *Ariadne*, 1878, and *Habicht*, 1881. In the "Annalen der Hydrographie," 1881, Heft x., is a description of these islands by Captain Jacob Witt.

Two lines or chains of islands, lying nearly parallel to each other, and running N.W. and S.E., are included under the name Marshall Islands. The more eastern is the Ratak (the *Radack* of Kotzebue), and the western is the Ralik. Each chain numbers about fifteen low coralline groups of islands. Several of these islands are very small, without lagoons; but the greater number are fully-formed atolls, and some of them are of an immense size.

The population of the archipelago does not, probably, number over about 10,000: 6,000 perhaps in the Ratak chain, and probably 4,000 in the Ralik Islands. And yet almost every one of their thirty atolls is inhabited; from which it may be gathered that the islands are but sparsely populated. Yet intercourse with a very considerable portion of the inhabitants is secured by taking a permanent station, for they roam in their proas from island to island of their respective ranges. There is comparatively little intercourse between the two principal chains.

Nominally each range is subject to a high chief, or more properly to a chief family. But several of the southern Ralik Islands are now independent of their feudal head, who lives on Aurh. So, also, in the Ralik chain, the four northern islands are held by a very slight cord of dependence.

The language of the two ranges is substantially the same, though there are

dialectic differences. And though the vocabulary of this language differs from any spoken in the Caroline Archipelago, its grammatical construction bears the most striking similarity to those westward.

In physical appearance the people are not unlike the Caroline islanders, as described on Ponapi and Kusaie, save perhaps that they are a little coarser and more vigorous in their manners, and perhaps also a little darker complexioned. They seem more excitable and merciful than any of the Caroline islanders we have met. It is sad to be obliged to report that disease has been rapidly introduced among the Ralik islanders by whale-ships passing the islands.

The only supplies which can be obtained at the islands are coco-nuts, bread-fruit, &c., and a few fowls and pigs may be had at some of the larger ones, where trading posts have been established. Water may sometimes be obtained by digging wells, but it is usually brackish.

Winds.—The weather about the Marshall Islands is unsettled. In May and June almost incessant rain and heavy squalls have been experienced, the wind usually being a little to the northward of East in the latter month, during the visit of H.M.S. *Espiègle*. The prevailing wind from November to June is the N.E. trade, but from July to October westerly winds, with unsettled weather, may be expected. The *Narragansett* experienced variable winds during July and August, the season of the doldrums, when much squally and rainy weather may be expected.

The Currents among the reefs and islets are very irregular and uncertain. Between about 4° and 8° N. the Equatorial counter current, running to the eastward, may be expected to be met with, running about 1 to 1½ knot.

The prevailing currents whilst among the Marshall group were from the eastward, about 1½ mile an hour, running occasionally, however, with equal velocity in the opposite direction, caused apparently by the change of wind, which was very variable, in September and October, with constant squalls and rain.—*Capt. Simpson, H.M.S. Blanche, 1872.*

The **RATAK CHAIN** is the westernmost, and contains fifteen groups of islands, in the following order, commencing from the South, viz.:—Mili, Majuro, Arhno, Aurh, Maloelab, Erikub, Wotje, Likieb, Jemo, Ailuk, Mejit, Taka, Utirik, Bikar, and Taongi. The last group, generally known as the Smyth Isles, is so far detached and uninhabited, that it will be described in the next Chapter.

As the recent spelling of these native names differs so much from the previous orthography, the older form will be given in parentheses.

MILI, (*Mille*), or *Mulgrave Islands*, received their English name from their discoverer, Capt. Marshall, in 1768. They were afterwards examined by Capt. Duperrey and Capt. Chramtschenko, and by M. Dutailis in 1848.

They appear to form a chain of atolls, together taking a sort of quadrilateral figure, about 30 miles in extent, W.N.W. and E.S.E. The islands, almost all

of which are connected with each other at low water, are sometimes separated at high tides by the sea. Having been formed successively from coral, marine productions, and the débris of vegetation, they have in the course of ages acquired their great breadth. Here and there are grouped some trees, among which are the native houses. These smaller masses of verdure give to the chain the appearance of small islands, on which cocoa-nut and bread-fruit trees, &c., form clumps of beautiful verdure. The parts covered with trees, being the largest, generally form the points around which the current runs very strong.

In general, the whole chain is very steep-to on the outside, and only increases on the side of the interior lagoon, where it is less disturbed by the sea, and where the coral banks are still in course of formation. When they reach the level of the water, they become, like the islands already formed, covered in their turn by sand and some vegetables.

The space enclosed by these islands is a real sea, navigable for every description of vessels. The bottom, generally at the depth of 22 to 27 fathoms, rises now and then nearer the surface, and shows in white patches, which thus indicating the dangers, also point out the spots where the anchor may be dropped. These banks, bestrewed with rocks, are nevertheless dangerous to anchors and moorings, because they will break the one and chafe the other, of which Capt. Dutailis says he had sad experience. To take the best position, attention ought to be paid to the rise of the tide. Its level has great influence on the quality of the bottom, and it ought only to be chosen, if possible, at low water.

Port Rhin, the ship passage into the lagoon, lies on the North side of the reef, between *Barr Island* (pronounced as if three *r*'s) and *Tokoeoa Island*, the first to the East, and the other to the West, of the entrance. On Tokoeoa are the stores of a German trading firm. The passage is about 2 cables broad, and in proceeding for the anchorage steer along the western reefs, passing between them and a reef lying 2 cables to the eastward, then haul to the S.W. and anchor as convenient in about 15 fathoms, mud and sand, 2 cables South of Tokoeoa Reef, with the centre of Barr Island bearing N.W.

The *Narragansett* anchored in 15½ fathoms, with the West end of Barr Island bearing N. by E. ¼ E., and the S.W. end of Tokoeoa N.W. by W. ¼ W., out of the tideway. The course in is about S.E. by S., the channel being straight and clear until inside the islets, with from 10 to 20 fathoms of water; the tide is strong, but it runs nearly in the direction of the channel. Fresh water, of a fair quality, can be procured from pits near the centre of Barr Islet, and wood may be obtained in small quantities; a few fowls and pigs can be procured, and fish are plentiful, but many sorts are poisonous.

To reach the anchorage, with winds from the eastern quarter, take up such a position as will allow you to range as near as possible to the pitch of the

North Pacific.

eastern reef, and round the bank attached to Barr Island as near as you please; it is shown by the whitish water. Pass southward of a rock lying 3 cables S.E. by S. $\frac{1}{2}$ S. from the observation spot on the South end of Barr Island. It is a small patch, over which the flood tide runs with a velocity of $1\frac{1}{2}$ knot; until half-tide it is indicated by very strong rippings, and becomes nearly awash at low water. Numerous shoal heads lie between this rock and the fringe reef to the northward.

The $2\frac{1}{2}$ -fathoms patch shown on the chart, 5 cables S.E. $\frac{1}{2}$ S. from the observation spot, was not seen from H.M. ships *Epiëgle* and *Emerald*; it is reported to lie farther to the north-westward.

In general, it is better to enter or leave with the tide, unless indeed the breeze is fair, and of sufficient force to overcome the strength of the current. The less distance you are inside the anchorage, the less difficulty there will be in getting out with westerly winds.

The observation spot on the South end of Barr Island is in lat. $6^{\circ} 14' N.$, long. $171^{\circ} 46' E.$, according to Capt. A. Bérard, of the French Navy. It is high water, on full and change, at 5^h ; springs rise $6\frac{1}{2}$ ft.

There was another passage, but for boats only, between *Anil Island* and *Bouguenieu*, the latter being the first islet to the West of Tokoea. The distance between these two passes may be about $1\frac{1}{2}$ mile.

There is a good passage into the lagoon, in lat. $6^{\circ} 15' N.$, long. $171^{\circ} 49' E.$, and a good anchorage immediately inside the lagoon off a small village, used by H.M.S. *Barrosa*.

Tapimoor Pass, about 8 miles eastward of Port Rhin, is bounded on the West by Tapimoor Island. The *Habicht* entered by this pass, and steered S.W. by S. for the anchorage off Mille Island.

There is a wide passage on the eastern side of the group to the lagoon. Between this passage and the N.W. point of the group there are eight other good passages for large ships. The best anchorage is at the S.E. end of the lagoon, in 8 fathoms.—*Mr. J. Bray*.

Mille Island, the largest of the Mulgrave group, is situated at the S.W. extreme, and is the residence of the chief, and the greater part of the population; all are Christians, a missionary living among them. In 1881, the population of the group numbered about 700. The anchorage is off the East extreme, in 16 fathoms, and there is good landing.

Between Mille Island and Port Rhin, there is no passage for even a boat over the reef, and south-eastward from Mille Island are a few very low islands. *Lukunos Island*, at the S.E. extreme of the group, has a wide passage on its western side.

Knox Islands, four in number, extend 4 miles, North and South, and lie 6 miles, W.S.W., from Lukunos Island, with a deep channel between them and the reef.

Keats Bank.—In 1872, Capt. Keats sounded in 13 to 5 fathoms, the bottom

being distinctly seen, on a shoal in lat. $5^{\circ} 55' N.$, long. $173^{\circ} 38' E.$, about 85 miles eastward of Mulgrave Islands.

MAJURO or *Arrowsmith (Meduro) Islands* were discovered by Captains Marshall and Gilbert, though their account and chart of them are not very definite. Capt. Chramtschenko examined them in detail. The group contains thirty-three islands, some very small, situated on a reef about 30 miles in extent, W. by N. and E. by S., and 10 miles wide. It is of the usual coral formation, enclosing a lagoon; the largest island, named Majuro, is 25 miles long, and bounds the southern and western sides of the lagoon. It is a magnificent island, with elegant forests of bread-fruit and pandanus. Cocoa-nuts, of course, abound, and bananas seem to be plentiful. The inhabitants are variously estimated between 1,500 and 3,000; they are constantly at war, the northern islands against the southern. Cocoa-nuts, taro, and fowls can be obtained. It is high water, on full and change, at $4^h 45^m$.

The entrance to the lagoon is on the North side, in about lat. $7^{\circ} 12' N.$; it is about $1\frac{1}{2}$ mile wide, but a shoal coral bank divides it into two channels, having a least depth of about 7 fathoms. The entrance is easily recognised by the small round islet on its western side; the West channel is close to this islet. When entering, this is perhaps the easier channel to distinguish, but it is farther to leeward during easterly winds. A vessel making this channel from the eastward should keep the small islet a little on the port bow, steering W. by S. until the passage is seen; a S.S.W. course leads through it. Having passed through, steer for a remarkable small sharp gap in the island on the East side of the atoll, until the white buildings on Ejeet Island are seen, when a course may be shaped for the anchorage.

A sailing vessel entering the East channel with an easterly wind, must luff close round the reef off the island on the East side of the entrance; when through, steer for the before-mentioned sharp gap, bearing E. by S., until the white buildings are seen.

The western portion of the lagoon is much encumbered with reefs, but the eastern part is free from danger, with the exception of an off-lying reef near the northern side. Inside there is an almost constant westerly current, weakest near the northern side. There is no entrance to the lagoon from the East side.

Ejeet Island is $9\frac{1}{2}$ miles from the entrance, and here is a trading station, where there is a tank of rain-water. On the shoal $1\frac{1}{2}$ cable S. $\frac{1}{2}$ W. from the southern flagstaff is a *beacon*, on which a *light* is placed at night when a vessel is known to be in the lagoon.

Good anchorage will be found in 25 fathoms, about 3 cables from the trading station on *Jeridy Island*, at the East end of the lagoon. The centre of Jeridy Island is in lat. $7^{\circ} 4' N.$, long. $171^{\circ} 24' 30'' E.$

ARHNO, *Daniel Islands*, or *Pedder Islands*.—To the East of the foregoing, Capts. Marshall and Gilbert discovered what they supposed to be two

groups, to which these names were applied, calling the broad and open channel separating them from Arrowsmith Island *Fordyce Passage*. The following description is principally from the reports of Lieut. Tanner, U.S. ship *Narragansett*, and Mr. J. Bray, master of the *Morning Star*, 1880.

Arhno has a greater extent of land than any other reef in the Ratak chain. It is of singular shape, and has a vast extent of reef, measuring more than 100 miles in circumference, approaching the shape of a square, with narrow prolongations to the N.E. and North. It is of coral formation, the land being from 100 to 600 yards in width, covered with iron-wood, cocoa-nut, pandanus, and bread-fruit trees, the tops of the trees being visible about 18 miles from the mast-head. In 1882 the population numbered about 3,000, the northern islands being frequently at war against the southern.

Extending about 4 miles N.N.W. from the N.W. point is a coral reef of 4 to 6 fathoms, where a vessel might anchor for the night in quiet weather. There is a trading station about 2 miles N.W. of the S.E. point, with anchorage outside in 15 to 20 fathoms, not over 200 yards from the shore, but unsafe, except with an easterly wind.

The enclosed lagoon is deep, and has few places with less than 22 fathoms. The eastern side appears tolerably clear of dangers, but the West side is said to be foul. The only entrances are on the North side, where there are four, two ship and two boat channels.

The course in through the eastern passage is about S. by E., carrying about 4 fathoms over the reef, and passing eastward of High Island, the trees on which are much higher than those on the adjacent islets, and it is conspicuous from all parts of the atoll. *Dodo Passage* is about 4 miles to the north-westward; the course in is about S.S.W., passing to the eastward of a small wooded islet on the inner edge of the reef, a little to the right of mid-channel. It is difficult to steer given courses in these passages, owing to the strong tides; the eye is the only safe guide. *Dodo Passage* is wider and clearer than the other; it can be seen but a short distance, as the islets on either side and that on the inner edge of the reef appear to be one. The two boat passages, between this and the eastern passage, are narrow.

H.M.S. *Rosario*, in 1874, entered by the East passage, finding $4\frac{1}{2}$ fathoms least water. On leaving, a passage about 1 mile to the North was used, 6 fathoms being the least depth obtained, and traders report that this is the best entrance to the lagoon.

A direct course from the eastern passage to the anchorage off the trading station leads close westward of three small patches, about 4 miles within the entrance; no other shoals were seen on this track.—H.M.S. *Emerald*, 1881.

The following positions were established by Commander Meade, U.S. ship *Narragansett*:—The N.E. point, lat. $7^{\circ} 9' 17''$ N., long. $171^{\circ} 56' 30''$ E.; the N.W. point, lat. $7^{\circ} 18' 47''$, long. $171^{\circ} 38' 38''$; the S.W. point, lat. $6^{\circ} 59' 37''$,

long. $171^{\circ} 31' 15''$; and the S.E. point, lat. $6^{\circ} 54' 2''$, long. $171^{\circ} 44' 10''$. It is high water, on full and change, at $4^h 45^m$.

AURH, Ibbetson, or Traversey Islands.—On Arrowsmith's chart a group, Ibbetson Islands, is marked, the same named by Kotzebue after the Marquis de Traversey, and by the natives Aurh.

This group is 15 miles long, N.W. by W. and S.E. by E., and 4 to 9 miles broad, enclosing a deep lagoon. On the surrounding reef are thirty-two islands, the N.W. of which is *Pigen*. The population is numerous when compared with the other islands, but scanty for its size; it is about 1,000. *Stobual Island*, at the N.E. end, has a very pleasant aspect. Kotzebue placed his anchorage in lat. $8^{\circ} 18' 42''$, long. $171^{\circ} 12' E.$ (by chronometer, $171^{\circ} 8' 14''$), and procured great quantities of cocoa-nuts here. Aurh is at the S.E. end of the atoll, and, as before mentioned, is the residence of the feudal chief of many of the groups. The S.E. island is in lat. $8^{\circ} 10'$, long. $171^{\circ} 12'$.

We entered through a passage about 200 yards wide, near the S.E. end of the island, having $2\frac{1}{2}$ fathoms least water. On leaving, we came out through one of the five passages we found through the N.W. reef, four of which are wide and deep.—*Mr. J. Bray.*

MALOELAB (Kaven), *Calvert, Bass Reef-tied, or Araktcheeff Islands.*—This group was discovered on board the ships *Scarborough* and *Charlotte*, June 29, 1788, and were named *Calvert Islands*, probably by Capt. Gilbert. The *Nautilus* saw some islands, July 5, 1799, which were then named the *Bass Reef-tied Islands*, which are identical with Calvert Islands. Capt. Kotzebue says their native name is *Kaven* (or Kawen), and he applies the name of Araktcheeff (or Araksheef) to them. Dr. Gulick calls them by the first name.

This group, consisting of sixty-four islands, was well surveyed by Kotzebue, and is 33 miles long, N.W. and S.E., and 5 to 16 miles broad, enclosing a deep and extensive lagoon, in which there is anchorage off some of the islands. Its inhabitants, about 1,000 in number, are precisely similar to those of Wotje, to the N.W. Kaven, or Araktcheeff, is the N.W. and largest island; it is $2\frac{1}{2}$ miles long, and three-quarters of a mile broad, and is in lat. $8^{\circ} 51' N.$, long. $170^{\circ} 49' E.$ The S.E. island is in lat. $8^{\circ} 29' 30''$, long. $171^{\circ} 11'$. It is high water, on full and change, at $4^h 35^m$; the greatest rise is 5 ft. Kotzebue found very good water in pits on some of the islands, but provisions were not very abundant.

Near the N.W. end is a passage half a mile wide, with three coral patches in it. From the N.W. end to the S.W. end there are eight good passages, several of which the *Morning Star* passed through.—*Mr. J. Bray.*

Tjan is a well-cultivated island, and only useful trees, such as the cocoa-nut, pandanus, and bread-fruit, are suffered there. The anchorage off this island is in lat. $8^{\circ} 52' 39''$, long. $171^{\circ} 1' 31''$. *Olot*, off which there is anchorage in 8 fathoms, coral sand, is in lat. $8^{\circ} 46'$, long. $171^{\circ} 9' 42''$ (by chronometer). *Torua*, which is twice as large as Tjan, is in lat. $8^{\circ} 43' 10''$, long. $171^{\circ} 9' 35''$. Thence

the atoll trends to the southward, and finally farther south-eastward (the islands being generally small) to *Airik*, which is about the same size as *Torua*, and affords a more beautiful prospect than any of the other islands. There is excellent anchorage, in 8 fathoms, about half a cable from the island, in lat. $8^{\circ} 31'$, long. $171^{\circ} 10\frac{1}{2}'$.

ERIKUB (*Egerup*), or *Bishop Junction Islands*.—This is the southern of two groups, which together were called *Chatham Islands*, from the voyage of the *Scarborough* and *Charlotte*, probably by Captain Gilbert. The northern group, *Wotje*, appears to have been considered as a portion of it, and Captain Marshall took them for the *Barbadoes Islands*, marked upon Anson's chart. They were surveyed by Kotzebue, who states the native name to be *Egerup*, and also gives the name of *Tschitschagoff* to them.

Erikub, or *Egerup*, lies to the southward of *Wotje*, and is somewhat smaller, being 25 miles in length, N.W. and S.E., and 6 to 11 miles in breadth. The whole circle consists of one reef, and contains comparatively few islands. Its South point is an island, probably named *Egerup*, the only one seen with cocoa-nut trees and people; but these, it was said, were limited to one man and two old women. Dr. Gulick says that it is uninhabited. A passage near this perhaps may be navigable, but is dangerous from its numerous turnings. There appears but little inducement for visiting the group. The South point is in about lat. $8^{\circ} 56' N.$, long. $170^{\circ} 6' E.$

WOTJE (*Otdia*), or *Romanzoff Islands*, lie about 3 miles North of the preceding. The latter name is applied by Kotzebue, but the remarks relating to their earlier discovery also belong to those of the *Erikub* group, as above stated.

This group was minutely examined and surveyed by Kotzebue, in January, 1817. It is of an irregular oval form, 29 miles long, East and West, by 6 to 12 miles in breadth. It consists of the usual encircling reef, on which are distributed sixty-five islands, of various magnitudes. *Wotje* (*Wotye*), or *Otdia*, is the easternmost and largest, about 2 miles long; the anchoring place inside it, which was called *Christmas Harbour* (or *Port Noel*), was ascertained to be in lat. $9^{\circ} 28' 9'' N.$, long. $170^{\circ} 16' 5'' E.$ As the low land here has no influence on the atmosphere, the barometer falls and rises as uniformly as it generally does between the tropics. The mean of the tidal observations gave for the time of high water, on full and change, $2^h 30^m$; the greatest range was 7 ft. The people were very friendly to Kotzebue, who remained here a considerable time; Dr. Gulick estimated the total population at 300. To the S.S.W. of it is an island, called by Kotzebue *Egmedio*, near to the S.E. angle of the reef; to the South of it is a small high island.

The reef is quite continuous to the N.W. of *Otdia*, and on it stands a connected chain of small islands, reaching as far as *Ormed Island*, at the North part of the reef, 8 miles from *Otdia*. The anchorage here is in lat. $9^{\circ} 33' 16''$, long. $170^{\circ} 10' 58''$.

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From Ormed, the North side of the reef, also quite continuous, runs to W.S.W., 8 miles, to *Bird Island*, and 9 miles still farther to *Goat Island*, from whence to the West end of the reef is 5 miles

There are several channels through the reef, all on the lee side. The first is $1\frac{1}{2}$ mile S.E. of the West point, narrow and impracticable; the next is *Rurick Strait*, 5 miles farther round the reef, by which Kotzebue entered. From hence the reef continues, without islands, nearly 20 miles, to *Schischmaroff Strait*, in every way preferable to Rurick Strait, as a ship can beat in or out with the usual trade-wind. To the East of this again is *Lagediak Strait*, 4 miles from the S.E. point of the group.

LIKIEB (Legiep), or *Count Heiden Islands*.—This group, first seen by Capt. Kotzebue, November 5, 1817, and more closely examined in his second voyage, perfectly resembles the others. There are forty-four islands in the group, which is 27 miles in length, N.W. by W. and S.E. by E., and from 7 to 12 miles wide. The natives are tall, handsome, robust men, advantageously distinguished from the other Radakers; they live chiefly on fish. Dr. Gulick states the population to be 300. There are two entrances to the lagoon, one on the South side, and the other on the West, which enable the lagoon to be entered or left with the trade-wind. From this cause, and the appearance of excellent anchorage, Kotzebue recommended this group to any navigator wishing to put into Radak.

On the N.W. side are several large islands, well covered with cocoa-nut trees. *Likieb*, the largest island, lies at the S.E. extreme, and belongs to a European firm engaged in planting cocoa-nuts; its S.E. end is in lat. $9^{\circ} 48' N.$, long. $169^{\circ} 21' E.$ It has a supply of good water.

The ship passage into the lagoon is South Pass, near the middle of the southern reef. It is divided into two channels by a small island just inside the lagoon; vessels may use either channel, taking care not to pass too close to the eastern side of the island. On the West side there are two passages northward of Kapenor Island, suitable for small craft only, both being obstructed by reefs. Anchorage may be obtained outside the lagoon, off them.

The lagoon is tolerably clear of reefs in the northern part, but much obstructed by dangers in the S.E. portion. The anchorage off Likieb is in not less than 9 fathoms, good holding ground, and sheltered from winds from N.E. and W.S.W. There is also good anchorage, in 5 to 15 fathoms, westward of the island next North of Likieb, on a gradually shelving bottom of sand and mud.

JEMO (Temo), or *Steep-to Island*, is a small island, seen in the *Nautilus*, to which the latter name was applied. Capt. Kotzebue says its native name is *Temo*. It is a small uninhabited sandy island, three-quarters of a mile in extent, N.E. and S.W., the centre being in lat. $10^{\circ} 6' N.$, long. $169^{\circ} 42' E.$ It may be approached on its western side to about half a mile distant, but a reef, with breakers, extends 5 miles from the N.E. side, and from thence discoloured water, with depths of 20 to 30 fathoms, extends to the S.W. part of Ailuk.

MEJIT (Miadi), or *New Year Island*, was discovered by Kotzebue, January 1, 1817. It is a low woody island, 3 miles long, North and South, and three-quarters of a mile broad. This island is surrounded by reefs, extending $3\frac{1}{2}$ miles to the N.E., from 1 to $1\frac{1}{2}$ mile on the North and West sides, and about 2 cables to the southward. It is clothed with a lovely verdure, and is inhabited by a similar race to those on the Kutusoff Islands, but they are said to be not more than 50 in number. The position of the middle of the island is lat. $10^{\circ} 17' 30''$ N., long. $170^{\circ} 55'$ E.

AILUK, *Tindal and Watts*, or *Krusenstern Islands*.—Admiral Krusenstern considers this group to be the same as that named by Capt. Marshall, in 1788, Tindall and Watts Island. Kotzebue supposed it to be a new discovery, March 1, 1817, and applied the name of the great hydrographer to it. Its native name is Ailu (or Ailuk). Kotzebue surveyed it.

The group is 20 miles long, N.N.W. and S.S.E., and 5 to 8 miles broad, and has about 120 inhabitants. Kotzebue entered the lagoon by a deep but narrow channel towards the North part. The eastern side of the group is formed by a chain of islands, but the western side consists of a coral reef. *Ailuk*, or *Ailu*, which gives its name to the whole, is at the S.E. end; it is small, scarcely a mile long, but has a pleasing appearance, and is distinguished from the rest by its tall palm-trees. Good water can be obtained here. Its centre is in lat. $10^{\circ} 12' 30''$ N., long. $170^{\circ} 4'$ E. *Capeniur Island* is the northernmost of the group. Kotzebue's anchorage was in lat. $10^{\circ} 17' 25''$, long. $169^{\circ} 59' 20''$. It was high water, on full and change, at 4^h 53^m; the rise was 8 ft.

Near the northern part of the western reef there are reported to be two narrow but clear passages into the lagoon at high water, and also a boat passage near the western part of the South reef. The anchorage in the lagoon is, off Ailuk Island, in 12 fathoms, not nearer than $1\frac{1}{2}$ mile to the island. The anchorage in the northern part is better.

UTIRIK (Udirick), *Kutusoff or Button Islands*.—On a chart inserted in the voyage of Governor Phillip, two islands are marked as the Button Islands, from the authority of Capt. Marshall, 1788. They were not inserted on any other chart, and thus Kotzebue considered them as a fresh discovery, May 21, 1815, on his passage to Kamchatka. This group and Taka, taken together, have almost a North and South direction, and extend thus for 28 miles. *Kutusoff*, or *Utirik*, at the S.E. end, was the only one inhabited. The island first seen by Kotzebue had a beautiful grove of cocoa-nut trees. The people came off, and were friendly; they were of a black colour, with straight black hair. The island is now stated to be cultivated, but not permanently inhabited.

According to Kotzebue, the North point of the reef is in lat. $11^{\circ} 29'$ N., long. $169^{\circ} 54'$ E. Utirik Island is in lat. $11^{\circ} 14' 30''$, long. $169^{\circ} 57'$.

TAKA (Tagai), or *Souworoff*, like the former group, consists of small islands, connected by coral reefs, and seems to contain deep water in the

centre. Though it is thickly covered with trees, not a single palm-tree was to be seen. Like Utirik, it is cultivated, but not permanently inhabited. The channel separating the two groups is $3\frac{1}{2}$ miles wide, free from rocks, and of unfathomable depth. The latitude of the channel is $11^{\circ} 12'$, long. $169^{\circ} 51'$.

BIKAR (Bigar), or *Dawson Island*, is the northernmost of the islands hitherto considered as belonging to the Ratak chain. Its second name is derived from Capt. Marshall's chart. Bigar, from the statement of a native to Kotzebue, is triangular in shape, consisting, for the most part, of reefs, and contains only three small islands, on the eastern reef, and all overgrown with trees, but no cocoa-nut trees. There is a trading station upon the southern island, and a passage for small craft into the lagoon exists through the western reefs, but is dangerous on account of the rapidity of the tidal streams. The natives come here to catch turtle and sea-fowl. The southern island is in lat. $12^{\circ} 14' N.$, long. $170^{\circ} 15' E.$

Taongi, or *Smyth*, or *Gaspar Rico Islands*, the S.W. extreme of which is in lat. $14^{\circ} 31' N.$, long. $169^{\circ} 1' E.$, is an uninhabited group, included by Dr. Gulick among the Marshall Islands. But as it is so isolated to the northward, it will be described in the next Chapter.

Captain Moore, of the *Morning Star*, says:—The two chains, Ratak and Ralik (meaning East and West), might be regarded somewhat in the light of a large town, with alleys, streets, and avenues running through it, the inhabitants passing and repassing, engaged in like occupations, seeking the same amusements, and governed by the same laws. A great uniformity of character is observed.

That space of ocean comprehended between the two chains, and stretching from the Bonham Islands, on the South, to the Rimski-Korsakoff (Rongerik) on the North, we will call the "Radak Sea." This sea, 300 miles long, and 100 miles broad, has been, as yet, but partially explored, and in which it is supposed there exist dangers of a formidable character. How far this may be true of the southern portion I am unable to say; but, having made a cautious survey of the northern arm, I am prepared to believe that navigation is endangered more by conflicting currents than by labyrinthine reefs. As may be supposed, among so many islands, there is no regularity in the set of the current.

The **RALIK CHAIN** runs parallel to the Ratak chain just described, and extends to the same parallel of latitude. The character of the separate groups composing it appears to be the same, and the inhabitants of each are acquainted with each other. There has been considerable confusion in the nomenclature; but with a view to including the earlier with the later decisions, the names as formerly connected with each other will be given where they differ from Dr. Gulick's arrangement, which will be followed here.

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The sixteen groups which compose the Ralik chain, commencing from the northernmost, are—Bikini, Rongelab, Rongerik, Ailinginae, Wotho, Ujae, Lae, Mentschikoff, Namu, Lib, Jabwat, Odia, Jaluit, Kili, Namorik, and Ebon.

RONGELAB (Bigini), or *Pescadore Islands*.—On September 3, 1767, Capt. Wallis discovered *two* islands, about 35 miles apart, which he supposed to be the *Pescadores* placed on Anson's chart; but, from some vagueness in his positions, they could not be well identified. Capt. Kotzebue, in his second voyage, made the matter more clear by the discovery of *three groups*, of which the easternmost he supposes to be the group in question, and says its native name is Bigini; but Dr. Gulick applies this name to the Eschscholtz or West group. According to Kotzebue, it is a group of low, thickly-wooded, coral islands, of pleasant aspect, forming, as usual, a lagoon, the greatest length, N.N.E. and S.S.W., being 16 miles.

Capt. Hudson, of the U.S. ship *Peacock*, says it is of a triangular shape, and has on its reef several islets and some sand-spits; the former are covered with a few low bushes, but it has no cocoa-nut or pandanus trees, and affords nothing but the pearl-oyster and turtles in the season. It had no inhabitants, but Dr. Gulick says that it now has about 120 inhabitants.

The lagoon is stated to be free from dangers, and can be entered by a passage, 9 miles wide, on its S.W. side. There is also a narrow pass at the N.W. extreme. Anchorage will be found in the N.E. corner. The South end of Enyvertok, the southern island, is in lat. $11^{\circ} 16' N.$, long. $167^{\circ} 43' E.$

RONGERIK (Radokala), or *Rimski-Korsakoff Islands*, is the second of the three groups discovered by Kotzebue, who named it after his second lieutenant, including with them Ailinginae to the S.W. The U.S. Exploring ship *Peacock* examined it, but could not effect a landing, on account of the surf. Although a few persons were seen on it, yet there was no appearance of permanent inhabitants; it seemed to be without any vegetable productions capable of sustaining life.

It consists of the usual reef encircling a lagoon, with several small low islands, principally on the eastern side. It is 36 miles in extent, N.E. by N. and S.W. by S., and from 3 to 20 miles broad, its eastern side forming a deep bay. There is a wide entrance to the lagoon on the South side, with a depth of 9 fathoms, westward of Rongelappalap Island, the S.E. island of the group, and there are several other passages. That to be preferred carries 10 fathoms water between Gogan and Enybarber Islands, in lat. $11^{\circ} 31' N.$ There are two good anchorages westward of Rongelap Island, in lat. $11^{\circ} 23'$, on either side of a projecting spit of sand; also in 6 to 9 fathoms, N.W. of Rongelappalap. The latter island is planted with cocoa-nuts, but has few inhabitants; its West point is in lat. $11^{\circ} 14\frac{1}{2}' N.$, long. $166^{\circ} 59' E.$

AILINGINAE, 12 miles S.W. of Rongerik, is 15 miles long, East and West, by 4 miles wide, and is uninhabited. The lagoon is shallow, and abounds with fish. There are a few cocoa-nut trees on the western islands; the eastern

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side forming a deep
side, with a depth
land of the group,
carries 10 fathoms
31' N. There are
11° 23', on either
N.W. of Rongelap-
as few inhabitants;

ong, East and West,
, and abounds with
islands; the eastern

islands are said to produce iron-wood. Knox Island, at its S.E. end, is in lat. 11° 5' N., long. 166° 35' E.

BIKINI (*Udia-Milai*), or *Eschscholtz Islands*, is the westernmost of these groups, and was named by Kotzebue, in October, 1825, after the naturalist of his expedition. He saw only the western part of the group, which he placed in lat. 11° 40' N., long. 165° 24' 25" E. Capt. Chramtschenko also saw only its western portion. "Next day we came up with an island, named by the charts Eschscholtz Island. At noon, December 19th, 1858, we were close in-shore, in lat. 11° 38' N., long. 165° 37' E. Could see twelve islands lying in an East and West direction. We, being about the centre, stood for a channel 3 miles in width between two islands. On getting near we could see the bottom stretching across; sent a boat to sound, found 11 fathoms, and sailed over. We tacked and stood out, speaking a canoe on our way, with a chief on board, who informed us that the name of the group was Bigini. We cleared the western extremity at sunset, which is a circular reef. This part is very dangerous, as all the adjoining islets are small and very low, some of them having only a few bushes. I noticed one peculiarity in this group; the bars between the islands and shoals inside are more sunken than any we have seen heretofore, with several deep channels into the lagoon. They are a very fine race of people, if those in the canoe were a fair specimen."

The North side of this atoll, which is about 18 miles in extent, East and West, is submerged to a considerable depth; but at the South side there is a wide passage through the reef, carrying from 11 to 12 fathoms water. The islands are unproductive, and inhabited by about 30 people.

WOTTHO, or *Shanz Islands*, a group of thirteen islands, were discovered May 30, 1835, by Capt. Shanz (or Schantz), of the Russian Navy, in the imperial ship *America*, on her passage from Port Jackson to Kamchatka.* It consists of a triangular reef with numerous small islands, enclosing a lagoon, together extending 18 miles, N.N.W. and S.S.E., and from 4 to 12 miles broad. The population amounted to about 40. The lagoon is accessible to small vessels by a 4-fathoms pass on its West side, between Ombelim and Eirek Islands, in lat. 9° 57'. Some rocks obstruct this passage, but they may be avoided by keeping nearer to Ombelim, the northern island. The northern pass is full of rocks, and should be avoided. The anchorage is off the S.W. side of Wottho Island, the N.E. island of the group. The centre of Wottho Island is in lat. 10° 11' N., long. 166° 6' E. Mr. Milne, of the schooner *Jimatas*, says the current runs strongly to the westward near these islands.

There was formerly considerable confusion in the hydrography of the groups south-eastward of Wottho, arising out of the imperfect descriptions and vague

* Another announcement near this is *Kabakala Island*, from whaler report, in lat. 10° 5' N., long. 166° 45' E. It is most likely the same as Shanz Island. Another whaler announced a group of islands in lat. 9° 1' N., long. 164° 40' E.

positions assigned by different discoverers. Later observations have, however, cleared up these discrepancies, though it is somewhat difficult to reconcile the various groups, as at present known, with the former very imperfect descriptions.

UJAE, or *Catharine Islands*, the western of these groups, is formed by an extensive reef, 32 miles long, N.W. by N. and S.E. by S., and from 4 to 10 miles wide, enclosing a lagoon. They lie in the track of vessels between Australia or New Zealand and China. Ujæ and Enylameej, the southern and northern islands, are considered to be the finest of the Marshall group, producing everything that can be grown upon any of the other islands. The inhabitants number about 300.

There are two ship passages on the West side into the lagoon; that recommended for entering is in about lat. 9° N., formed by sunken reefs situated 4 miles northward of Bock Island; this pass carries from 3 to 6 fathoms water, with room to work through. The eastern side of the lagoon is moderately clear of shoals, but the West side is full of dangers. If bound for the anchorage off Ujæ, it is advisable to follow the eastern reef about 1 mile distant, and not to approach Ujæ under a depth of 5 fathoms. The pass South of Bock Island is deep, and can be used when leaving. The West end of Ujæ is in latitude $8^{\circ} 48' \text{ N.}$, long. $166^{\circ} 8' \text{ E.}$, but observations by the officers of the U.S. ship *Essex*, 1884, place it in long. $165^{\circ} 41' 53'' \text{ E.}$ The *Serpent Group*, seen by Capt. Hammond, R.N., in H.M.S. *Serpent*, in lat. $9^{\circ} 14' \text{ N.}$, long. $166^{\circ} 2' \text{ E.}$, were probably the North end of Ujæ.

LAE, or *Brown Islands*, is a discovery in the missionary ship *Morning Star*, December, 1858. Her commander, Capt. J. W. Brown, thus describes it:—"Sunday morning, the 19th, was surprised at seeing land very near ahead, as none is shown in my charts in that place. On coming up with it, found it to be a group of fourteen islands, encircling three sides of a beautiful lagoon, the western part being protected by a reef, with a small channel. A canoe came off, having two men on board. I gave them some presents, asked the name of the group, which is *Lai* or *Rai*, and left this little gem. The canoe brought off some very fine bread-fruit and cocoa-nuts."

These islands lie close together upon a small reef about 6 miles in diameter, having a narrow passage into the lagoon from the westward, in which the depth is 2 fathoms, but vessels can anchor off the entrance in 4 fathoms. Some shoals lie about 1 cable S.W. of the anchorage. The inhabitants number about 250. Lae Island, at the S.E. end, is in lat. $8^{\circ} 57' \text{ N.}$, long. $166^{\circ} 27' \text{ E.}$

MENSCHIKOFF ISLANDS.—This group of islands, the South extreme of which is in lat. $8^{\circ} 42' \text{ N.}$, long. $167^{\circ} 47' \text{ E.}$, encloses the largest lagoon in the Marshall Archipelago, the West side extending 58 miles, N.W. $\frac{1}{4}$ W. and S.E. $\frac{1}{4}$ E., its greatest breadth being 18 miles. Notwithstanding its extent, the inhabitants number only about 200. Except on Kwajalein at the South extreme, and the islands situated on the N.E. of the Ailing-Jappel group, there

are few cocoa-nut trees upon these islands, and the natives visit them only for curing fish. The islands on the N.W. side are almost destitute of trees. The South end of Kwajalein Island is in lat. $8^{\circ} 41' N.$, long. $167^{\circ} 46\frac{1}{2}' E.$ The West point of Ebadon, the N.W. island, is in lat. $9^{\circ} 25' N.$, long. $167^{\circ} 8\frac{1}{2}' E.$

This would appear to be the three groups of islands discovered by the English ship *Ocean*, in 1804, the northern part being named Catharine, the central part Lydia, and the southern part Margaretta, the latter being identical with the Paterson Islands of the brig *Elizabeth*, in 1809. These islands also exactly agree with the islands Kwadelen, Lileb, and Namou, on Kotzebue's chart.

There are twenty-five passages into the lagoon, but six only of these can be considered as ship channels. The South pass, 4 miles N.W. of Kwajalein, carries a depth of 10 fathoms. Upon the eastern side, the pass South of Bigedj Island, in lat. $8^{\circ} 52'$, has 7 fathoms; upon the North side, the North pass, eastward of Mellu Islands, has 10 fathoms; upon the West side, the pass West of Eru Island, in lat. $9^{\circ} 10'$, carries 9 fathoms, and is considered a good pass for leaving the lagoon; the passage West of Onemak Island, in lat. $9^{\circ} 8'$, carries 20 fathoms, and is the best when bound for Ailing-Jappel.

The northern part of the lagoon is shallower than the southern. Anchorage can be obtained in it, off Kwajalein, in 15 to 7 fathoms; also westward of Meek Island, but the water here shoals suddenly. Between Gagan and Namtui-Roj, at the N.E. end, anchorage may be taken up, but off Namtui vessels should not anchor in less than 5 fathoms, and be prepared to leave by the North pass in the event of fresh southerly winds, which render that anchorage unsafe. Outside the lagoon, anchorage will be found off Eru Island, in 7 fathoms, also off Onemak in not less than 5 fathoms; all other places are too steep. It is high water, on full and change, at 4^h ; springs rise $5\frac{1}{2}$ ft.

LIB ISLAND is $2\frac{1}{4}$ miles in extent, East and West, triangular in shape, with reefs extending three-quarters of a mile from the South and East sides, $1\frac{1}{4}$ mile from the North side, and about 2 cables from the West side. The centre is of lower elevation than the coast-line; the soil is fertile, and there are about 50 inhabitants. There is no anchorage around the island. Its centre is in lat. $8^{\circ} 19' N.$, long. $167^{\circ} 28' E.$

Lib is most probably the Tebut Island of Kotzebue's chart, and the *Princessa Island* of Captain Dennet, of the *Britannia*, in lat. $8^{\circ} 20' N.$, long. $167^{\circ} 30' E.$, which was also seen by Capt. Hagemeister. It was seen by Capt. Dunn, of the barque *Dragon*, in 1856. It was also seen by Capt. Moore, in the *Morning Star*. He says:—"Going aloft, I perceived that we were approaching a compact, small coral island, not more than $1\frac{1}{4}$ mile in circumference. We landed on the West side. There were 23 inhabitants, including men, women, and children. It was covered with a thick growth of pandanus, and a few low cocoa-nut trees."

NAMU, *Ailinglabelab*, or *Musquillo Islands*.—The latter name was given

by Captain Bond, who saw them the day after his making the Baring Islands, December 16, 1792. They are all well wooded, and inhabited, but are very low and dangerous, and in thick weather a ship might run on the reef without seeing the land. Capt. Chramtschenko discovered that the group encloses two lagoons, separated by a reef. At a short distance it might be taken for two groups. Together they extend 36 miles, N.W. by W. and S.E. by E., the greater number of islands being situated around the southern end. Bock Island, on the western edge of the reef separating the lagoons, is in lat. $7^{\circ} 59' N.$, long. $168^{\circ} 11' E.$ There are about 150 inhabitants. The name of *Lambert* was given to the northernmost portion, and *Ross* to the southern, by Capt. Dennet, of the *Britannia*.

The largest island, named Musseket, lies on the N.E. side of the South lagoon, the passage into that lagoon being upon the S.W. side, about 4 miles westward of Leuen, the southern island; there is anchorage southward of the West point of this island. The islands Namu and Madaamet, at the N.W. extreme, are sparsely covered with cocoa-nut trees. There is anchorage westward of the former, which is in lat. $8^{\circ} 11' N.$, long. $167^{\circ} 58' E.$

Great caution must be observed when passing to leeward of the reefs, in consequence of the easterly set, and during May to September breakers are rarely seen upon the reefs on the lee side of the southern lagoon.

ODIA, or *Elmore Islands*.—This group was named by the *Elizabeth*, in her passage from Port Jackson to China. The discoverer saw two small islands, but Capt. Chramtschenko found that it consists of a large island and nearly twenty smaller ones, named Odia by the natives. They are connected by coral reefs, extending 28 miles, N.E. and S.W., and 15 miles in greatest breadth, and are sometimes called *Chramtschenko Islands*. On the charts by Kotzebue it is called *Helut*. There are about 200 inhabitants.

The lagoon, which contains many reefs, can be entered by five passages. The South pass, in lat. $7^{\circ} 14'$, is deep, and there is anchorage in it off a large house, westward of Enyebing Island, in 5 fathoms. This is the best passage, and in approaching from the westward it opens out when bearing N.E. by N. A village stands on its East side. With winds from the eastward there is anchorage outside the lagoon, in 10 to 12 fathoms, sheltered by Wotja Island, the western island. Airek, the southern island, is in lat. $7^{\circ} 12\frac{1}{2}' N.$, long. $168^{\circ} 53' E.$, and there is anchorage off it in the lagoon.

JABWAT ISLAND is situated 9 miles, N. $\frac{3}{4}$ W., from Jib Island, the northernmost of Elmore Islands, from which it can be seen. It is three-quarters of a mile long, N.N.W. and S.S.E., by a quarter of a mile wide. It is surrounded by reefs, extending a quarter of a mile from the South and West sides, and three-quarters of a mile from the North and N.E. sides. There are but few inhabitants. It is in lat. $7^{\circ} 43' N.$, long. $169^{\circ} 4\frac{1}{2}' E.$

JALUIT, or *Bonham Islands*.—The brig *Elizabeth* discovered, in 1809, "a very extensive group of islands, joined together by low sand (coral?) banks."

They were called *G. Bonham's Island*. Capts. Duperrey and Chramtschenko examined them; the former called the northern portion *Coquille Islands*, and the southern part *Elizabeth Islands*, from the ships which discovered them.

This group is 32 miles in extent, N.N.W. and S.S.E., and 7 to 20 miles in width, consisting of four or five large islands and numerous smaller ones, with one in the enclosed lagoon. Mr. Bray states that Jaluit has become the most important part of Micronesia. Upon the North point of Jabor, or Bonham Island, is a large trading settlement, whence large quantities of coral, &c., are shipped to Europe. This is a good place for a ship to recruit, as there is plenty of good water, and pigs, fowls, bread-fruit, and cocoa-nuts may be obtained from the natives, and occasionally ship's provisions from the traders. The German Government has also established a coaling station here for men-of-war. In 1882 the population of the group numbered about 700.

The lagoon appears to contain more coral shoals than the lagoons of the other groups, necessitating very cautious navigation. There are four good passages into it on the East side, and one on the West. The S.E. or *Barrosa Passage* is the best, being short, and having 8 or 9 fathoms water, close round the North end of Jabor Island. Sailing vessels go out by the S.W. passage, bearing S.W. $\frac{3}{4}$ W. from the anchorage off the trading station; it is broad and deep, but there is a sharp turn in it, and a strong current. There are also three good passages near each other, to the N.N.W. of the settlement.

When approaching this group from the southward, they appear as one long low island, the gaps in the vegetation being difficult to distinguish. To enter by the S.E. entrance, it is advisable to make the South extreme of the islands, and to steer N.E. by N. along the reef, until the settlement is seen, bearing W.S.W. The entrance will not be recognised until close in, the sea apparently breaking right across it, and it is recommended to take a pilot. The channel is less than half a cable in width, and the current sets across it in a N. by W. direction, running with great strength near the time of spring tides.

On rounding the North end of Jabor Island, good anchorage will be found off the settlement, in 8 to 19 fathoms, sandy bottom; that recommended is with the trading station bearing N.E. by N. $\frac{3}{4}$ N., distant 3 cables. There are two dangerous patches of coral in the anchorage, one small patch of 3 fathoms nearly in the centre, and another awash at low water nearer the shore. There is a beacon on the rock in the middle of the anchorage. The southernmost of three piers is the most convenient for landing. The North end of Jabor Island is in lat. $5^{\circ} 55' N.$, long. $169^{\circ} 39' E.$

The North shoal in Jaluit anchorage is now marked by a small buoy; the southern shoal has a small stick on it, and dries at low water springs; both shoals are easy to see.—H.M.S. *Espiègle*, 1883.

KILI (*Namureck*), or *Hunter Island*.—This island was first seen by Capt. Dennet. It extends $2\frac{1}{2}$ miles, E.S.E. and W.N.W., and is in lat. $5^{\circ} 42' N.$, long. $169^{\circ} 9' E.$ It is uninhabited, and landing is rarely practicable.

NAMORIE, or *Baring Islands*, were discovered by Captain Bond, in the *Royal Admiral*, December 15, 1792, and were named after the chairman of the court of directors of the East India Company. They are two in number, lying on a coral reef about 5 miles in diameter, and enclosing a lagoon only accessible to boats at high water. There is no anchorage here. The islands are flat and wooded, and contain about 300 inhabitants. There are two German trading stations here, where cocoa-nuts, bread-fruit, bananas, and taro can be obtained. The S.W. point is in lat. $5^{\circ} 35' N.$, long. $168^{\circ} 6' E.$

EBON, *Boston*, or *Covell Islands*.—From information given by Captain Duperrey, these islands were discovered May 25, 1824, by an American vessel, under Captain George Ray, who called them Boston Islands. The name of Covell (or Cowell) is from an American commander, of the barque *Alliance*, who thought them a new discovery in 1831. They have been called *Linnes Islands* by a whale ship, and it is also called the *Fourteen Island Group*. In 1845 a vessel was attacked outside the reef by three proas carrying 150 men, and was nearly taken. They are the southernmost of the Ralik chain, and were examined by Lieut. Tanner, U.S. ship *Narragansett*, in 1872.

The group consists of twenty-one well-wooded islands, lying on a reef about 25 miles in circumference, and is thickly inhabited by an able-bodied race of men, who are of a light copper complexion, and about 1,200 in number. Ebon Island, the southern and largest, is 6 miles long, and near its S.W. end are the head-quarters of the Micronesian mission. It is also stated to be the chief station of the cocoa-nut oil trade. Trading vessels from Sydney, N.S.W., occasionally call here, and the mission schooner comes here annually from Honolulu. The water is bad, and rain-water is collected for domestic purposes. Wood, fowls, pigs, fish, cocoa-nuts, &c., are plentiful.

The only entrance to the lagoon is on the S.W. side, between the second and third islets to the N.W. of the S.W. end of Ebon, the northern islet being called Mej, and the southern Jurij; as this is the only break in the reef, the channel is not readily mistaken. This passage is narrow and crooked, with strong tides running 3 to 7 knots on the ebb, making it unsafe for large vessels except at slack water; the least depth is 9 fathoms. A stranger should employ a pilot.

Having entered the lagoon the navigation is simple, occasional shoal patches being easily avoided, with a bright sun. There is good anchorage in any part, the depth varying from 5 to 28 fathoms. The *Narragansett* anchored in 15 fathoms, sand and coral, with the S.W. point of Ebon bearing S.W. by S., and the North end of Jurij N.W. $\frac{1}{4}$ W. It is high water, on full and change, at $4^h 45^m$; the rise is 6 feet.

The centre of the atoll is in lat. $4^{\circ} 37' 25'' N.$, long. $168^{\circ} 43' 31'' E.$ Mej Islet is in lat. $4^{\circ} 36' 34''$, long. $168^{\circ} 41' 42''$. Rube, the S.W. end of Ebon Island, is in lat. $4^{\circ} 35' 25''$, long. $168^{\circ} 42' 10''$.

ENIWETOK, or *Brown Group*, was discovered by Capt. Thos. Butler, in the ship *Walpole*, December 13, 1794. He named them *Brown Range*, after the chief super-cargo at Canton, and also the North island *Arthur Island*, and the southern *Parry Island*. They were more minutely examined by Captain Fearn, in the snow *Hunter*, November 17, 1798, who named two other islands *East* and *West Danger Islands*. He says:—Parry Island is not only the southernmost of Brown's Range, but the eastern boundary of a most dangerous and extensive line of keys or shoals, which occupy more than half a degree of longitude, without a single apparent passage through which a stranger should attempt to go. Capt. Fearn's positions are identical with Capt. Butler's, but both are 28' too far East.

Dr. Gulick includes them in the *Ralik* chain of the Marshall Islands, although so far removed from them, and calls it by the first name. The few natives, only 30 or 40 in number, speak the Marshall Islands language.

They were surveyed by Lütke, in November, 1827. He ran along the coral reef forming its North and West sides for two days; on the reef are about thirty low islands and reefs, enclosing a lagoon. It is a nearly circular atoll, 20 miles in diameter North and South, and 26 miles East and West. *Arthur Island* is in lat. $11^{\circ} 40' N.$, long. $162^{\circ} 15' E.$; the West extreme of the atoll in lat. $11^{\circ} 30'$, long. $162^{\circ} 1'$; and *Parry Island* in lat. $11^{\circ} 21'$, long. $162^{\circ} 25'$.

UJILONG, *Arrecifos*, *Casobos*, or *Providence Islands*.—On the early Spanish charts two groups, under the names of *Arrecifos* and *Casobos* or *Casobas*, were shown hereabout; but their existence was not verified till 1811, when the ship *Providence* discovered a group, to which the name of the ship was applied. Dr. Gulick, who calls the native name *Ujilong*, says that there is but one reef here, so it must include the two older notices. He says the population of Ujilong is 1,000. It was visited in 1864 by Captain James, in the missionary ship *Morning Star*, who states that, although to the westward of the *Ralik* chain, the natives speak the Marshall Islands dialect. It was also visited by the *Dundonald*, Captain Kewley, in 1867; he speaks of the large quantity of cocoa-nuts.

This group, consisting of thirteen islands and several sand kays, extends 24 miles, E.S.E. and W.N.W., and 7 or 8 miles in breadth, the reef enclosing a lagoon studded with coral patches. The islands are cultivated by a trading firm, whose station is on Uyelang, the S.E. island. There are two passages into the lagoon, both on the South side. Hayes or Wide Pass, the western, lies between two islets, and is the better; it has 4 fathoms in it, and also a shoal of $2\frac{1}{2}$ fathoms. Anchorage may be obtained just inside, in 18 fathoms, near the West islet, or 4 miles to the eastward, in 11 fathoms. The eastern passage, $6\frac{1}{2}$ miles to E.S.E., is narrow, and has only $2\frac{1}{2}$ fathoms water in it.

There is no anchorage outside the lagoon. Vessels visiting the trading *North Pacific*.

station anchor in 9 to 10 fathoms, about 3 cables from the reef off the eastern houses on Uyelang. The N.E. end of Uyelang is in lat. $9^{\circ} 43' N.$, long. $161^{\circ} 19' E.$

THE CAROLINE ARCHIPELAGO.

This extensive range of islands was, until recent times, comparatively unknown. This ignorance, and the terrible accounts of their dangerous character given by various navigators who had crossed the chain, caused them to be the subject of the greatest dread to all commanders sailing in their vicinity. All these fears and doubts have, like most others of their kind, been dispelled by the more exact knowledge which modern science gives of the actual character of the subjects it is applied to. It is chiefly to the voyage of Capt. Duperrey, in the French royal ship *La Coquille*, in 1823, and to the surveys of Rear-Admiral Lütke, of the Russian corvette *La Séniavine*, that we owe the greater part of our geographical knowledge of these islands.

It has been thought that the first notice of any portion of these islands was given by Diego de Roche, a Portuguese, in 1525, as the *Sequeira Isles*, but it is probable that his discovery was to the westward of the group. The same may be said of the *Reyes Islands*, discovered by Alvaro de Saavedra, in 1528. The first whose claims have any weight are Villalobos and Miguel Lopez de Legaspi; the first in 1543, the second in 1565, but neither of their discoveries can with certainty be recognised. The celebrated Sir Francis Drake also discovered a portion of the range, September 30, 1579. The next in order is Lorenzo de Baretto, who, in 1595, saw a large inhabited island in the group.

In 1686 the Spanish admiral, Don Francisco Lazeano, discovered a large island, to which he gave the name of Carolina, in honour of the consort of the reigning king, Charles II., but which island it is not now known. It gives the name to the archipelago. The name of the *New Philippines* has also been applied, but that has long been in disuse.

Among the more complete early accounts of the Carolines is that by the Jesuit padre, Juan Antonio Cantova, who visited several of the islands in 1721, and during his second voyage thither, in 1731, was killed at the Island Mogmog. Several navigators have visited portions since that time, as related in the subsequent particulars; but, as stated in the first instance, the chief sources of information are the works of Lütke and Duperrey.

The Caroline Islands, according to Krusenstern and Lütke, extend from the Pelew Islands on the West, to Ualan on the East, and from 2° to 12° North latitude. But this distinction is somewhat arbitrary. The natives of the Marshall Archipelago belong to the same race, so that the proposition of Dr. Chamisso to include all these islands in the single denomination of the Marianas is not without weight. But if it be necessary to adopt any divisions, it would be necessary to distinguish that part of the Carolines extending from the Mort-

lock to the Ouluthy group, which alone is inhabited by a nautical and commercial people. Those more East or West do not participate in this distinction.

The information collected by the missionaries, and the charts drawn up by them from native reports, were for nearly a century the only guides to navigators. But they could neither determine their relative sizes nor positions; so that many islands scarcely visible on the surface of the ocean, having a name as well as the larger groups, were placed as if miles in extent, and groups of ten or fifteen would occupy the extent of several degrees; this made the charts an inextricable labyrinth. Then the commanders who crossed the line of the archipelago in different directions, instead of meeting with entire archipelagoes, were astonished to find either no indications of land, or else some small spot to which they were delighted to apply some favourite name, which then took their places in the chart, without superseding the older ones. The native names also are frequently repeated, and disfigured both by the different pronunciation in various parts of the group, and by different systems of orthography. Such a chaos arose from all this, that any elucidation became a hopeless task. Such was the state of their geography before the *Coquille* and *Séniavine* cleared up all doubts, and declared their real character and number.

Among the later authors who have elucidated the geography of the archipelago in a more complete manner, may be enumerated Capt. Cheyne, commander of the *Naiad*, and the Rev. Dr. L. H. Gulick, of the Hawaiian mission.

The Caroline Islands consist of forty-eight groups, forty-three of which are coral atolls, and five of them are basaltic surrounded by fringing coral reefs. These coral islands are immensely populous for their area. Capt. Lütke considered that the total length of these islands would not exceed 100 miles, and as most of them do not exceed 200 yards in breadth, the entire area of the habitable portion of the atolls would not be more than 15 square miles. Dr. Gulick estimates the area of the entire archipelago as 877 square miles, and the number of people in 1860 as 18,000, but by the latest estimates of the missionaries they are about double this. They are claimed as a Spanish possession, but it is merely nominal, and in August, 1885, the German gunboat *Itis* took possession of Yap, thus giving rise to a dispute with Spain.

The inhabitants of all these islands are scions from the same stock. Chamisso considers them as the same as all the Malay tribes peopling eastern Polynesia. The works of Chamisso, the notices of Dr. Mertens on the people, of Captain Lütke, Kotzebue, and others, may be consulted with great interest on these and similar points.*

Dr. Gulick says that many different dialects are spoken on its widely separated islands, though they are evidently dialects of the same mother tongue,

* Among more recent publications we may mention the valuable work by Dr. A. Messon, entitled "Les Polynésien, leur Origine, leurs Migrations, leur Langage," published in four large volumes, Paris, 1880—1884, in which these questions are thoroughly discussed.

and are strongly allied to the Marshall Islands dialect, and even to the language spoken on the Gilbert Islands.

The character of the natives has been variously represented, and caution should be exercised when holding intercourse with them, as several instances of treachery have been recorded. Of late years, intercourse with the missionaries and traders has made them more trustworthy.

Climate.—We have no general account of the winds and weather of the whole archipelago, and from the fact that it lies in the belt of doldrums, or equatorial calms, there is considerable difficulty in defining the conditions of the weather in any particular season. Admiral Krusenstern says:—But we learn from the relations of several navigators that the N.E. winds are *not* the prevailing winds, which is confirmed by the fact that the inhabitants of several of the western islands have been carried in their canoes towards the East and N.E., a proof that during a portion of the year the winds blow from the West. The Pelew Islands are, as is known, in the limits of the monsoons, which may extend to the meridian of the Mariana Islands, and even some degrees beyond that, up to the point where they are arrested by the regular trade winds. This last part seems to be proved by the circumstance that the inhabitants of the Carolines, who perform their annual voyages from Lamurek to Guahan, situated several degrees to the East of that island, generally embark, from what M. Chamisso states, in April, returning in May or June; that is, they start towards the termination of the eastern monsoon, probably that they may not have long to wait for the return of the westerly monsoon, with which they return in May or June, when this monsoon is found to be in its greatest strength. M. Chamisso draws a conclusion from this opposite to that which M. Krusenstern does. He says that the islanders return in May or June, *before* the westerly winds set in; however, it is known that the westerly monsoon never comes later than the month of May.

The best account of the weather, &c., at Ponapi appeared in the American Journal of Science, from the pen of Dr. Gulick. The following is extracted from that account:—No island of the whole range, not even of Micronesia (which includes the Gilbert, Marshall, Caroline, and Mariana Islands), has yet been made a point for accurate meteorological observations, which will enhance the value of records on Ponapi.

“The following meteorological averages, deduced by Mrs. Gulick from her daily observations, extending through a period of three years, 1853—1855, will speak for themselves of the more important topics connected with climate. It is to be regretted that the want of necessary appliances has rendered these observations much less extensive through the whole field of meteorology than we would gladly have made them.

“*Average for three years*: Temperature.—Mean at sunrise, 78°.28; mean at noon, 83°.31; mean at sunset, 79°.27; maximum, 89°; minimum, 70°; range, 19°; mean, 80°.28.

"There are few who will not remark the astonishing uniformity of temperature exhibited in the preceding summary. It is to be questioned whether there exists a series of observations exhibiting as great a uniformity in any part of our globe. The South Seas, generally notorious as they are for salubrious equability of temperature, have probably not yet presented anything equal to this.

"The mean daily range is about 5°.

"The mean difference of successive days is about 1°.

"The utmost range of the thermometer, during three years, was from 89° to 70°, only 19°.

"The mean temperature of the three years was 80°.28.

"It should be remarked that the observations till May, 1853, were made in a most peculiarly unfavourable locality, which greatly exaggerated and distorted the thermometric conditions. The remaining observations were made from a locality such as would always be sought for a residence, and will without the slightest difficulty be found in every part of Ponapi. By these it appears that the yearly mean is about 80°.50; the utmost range about 12°; the mean at 7 a.m., about 78°; at noon, about 85°; and at 9 p.m., about 79°.50.

"Facts to be stated in connection with remarks on the winds and weather, will sufficiently account for this singular equability, particularly when it is remembered what an immense expanse of ocean surrounds all these Micronesian Islands."

Winds.—The following Table shows the distribution of the winds in the different months of 1854:—

Months.	Days of Trade-wind.	Days of Variables.	Calm Days.	Months.	Days of Trade-wind.	Days of Variables.	Calm Days.
January.....	29	2		July.....	11	11	9
February.....	28			August.....	7	24	
March.....	23	6		September.....	11	16	3
April.....	29	1		October.....	6	10	14
May.....	29	2		November.....	15	15	
June.....	22	8		December.....	29	1	

The predominating winds are the N.E. trades. During the northern winter, while the sun is in southern declination, and while, consequently, the whole system of aerial currents is drawn to the South, the island is fully exposed to their action. This period usually lasts from December to May, inclusive;

though there is much difference in different seasons. At times the trades do not set in till January, and again they begin to blow steadily as early as November, and they cease blowing at any period from April till June. There are certain seasons when they are but faint, even during the dead of winter, as in January and February, 1856; and, again, they may continually intrude themselves during all the summer, as in 1856.

CURRENTS.—During the period when the N.E. trade is freshest, strong westerly currents are generally experienced. From the middle of August to the middle of November, when strong westerly winds, with heavy squalls, may be expected, strong easterly currents prevail.

On the subject of currents, they have been found very violent to the South of the Pelew Islands, bearing to the East, at the rate of 2 or 3 miles an hour, particularly in the months of June, July, and August, that is, during the strength of the S.W. monsoon. In the memoir on the currents, mention is made of this current, as the equatorial counter current.

GALES.—It may be remarked that the severer class of gales are comparatively unknown here. The typhoons of the China Sea, and even of the seas North of the Marianas, about the Bonin Islands, rarely (if ever) extend to this island. Yet once, during the youth of a few of the very oldest inhabitants now living, a desolating wind swept over the island, so tearing up the bread-fruit trees—the principal reliance for food—that an awful famine ensued, and large numbers died. It would seem possible that this was a cyclone. And it is very interesting that a similar gale produced similar results at Kusaie, or Strong Island, 5 degrees East of Ponapi, and that, too, in the memory of the very oldest inhabitants. May not this have been the very same erratic cyclone that swept Ponapi?

WEATHER.—Without being able to give accurate hydrometric figures, the observations recorded regarding the general character of the days exhibit the fact that there is much humidity, though nothing excessive. Situated just on the southern confines of the N.E. trades, and under the northern edge of the cloud zone that hovers over the equatorial regions between the two trade wind zones of the North and South hemispheres, the island is constantly exposed to precipitations from above. Before the trade winds reach the island, they have made their passage over thousands of miles of ocean, and have become saturated with moisture; so that, as soon as they impinge on the central elevations of the island, some of which are 2,858 ft. in height, the clouds are arrested, and showers fall; and, as the island is but little more than 15 miles in diameter, they readily pass over them and water the lee no less than the windward slopes. And again, during the summer, while the trades have receded northwards, we are, ever and anon, shaded by the equatorial clouds, which pour their contents most bounteously: yet we are constantly so near the northern boundary of this zone, that we do not experience its severer, its protracted, and unpleasant pouring rains of weeks and months. The humidity is consequently more equa-

bly distributed through the year than in most tropical regions; yet we speak of the summer as the season most rainy, if not as the "rainy season." It must be remarked, however, that the year, 1856, during which the trades were very faint through all their usual months, and were quite intrusive through all the months during which they usually absent themselves, was the driest remembered by the oldest inhabitants.

Of the *electric phenomena*, I can only report that thunder is rare and lightning still rarer. Thunder was heard only on twenty-eight days in three years, and lightning only seen on eight days. So very seldom does lightning prove destructive, that the natives have never suspected its agency, but attributed its results to a direct visitation from their *Ani* or Spirits, the only gods they reverence.

During the months of June and July, 1872, while amongst the Caroline group, light and variable winds, with much rain, were experienced by H.M.S. *Blanche*; the current was also variable, but set generally to the eastward.

The orthography here adopted is that given by Dr. Gulick, as based upon the system of Lepius, established by his mission. As may be well understood, there is much confusion in the early names, each voyager spelling the difficult native pronunciation in his own national method.

The description of the archipelago begins with the easternmost, and proceeds in a westerly direction. Great vigilance is necessary in navigating among these groups, as there has been no connected survey, and some are very imperfectly known. The positions here given must therefore only be considered as approximate.

KUSAIE, Ualan, or Strong Island, the easternmost, and one of the lofty basaltic peaks of the Caroline Islands, was discovered, in 1804, by Captain Crozer, commanding an American ship, who gave it the name *Strong*, after the governor of Massachusetts. Capt. Duperrey sought for and found it in June, 1824, proving that Capt. Crozer's position was very exact. He passed ten days here, and made a minute survey of it. "The Island of Oualan," says Captain Duperrey, "may at some future time become of great importance. Lying in the track of vessels going from Australia to China, it offers at the same time good ports for careenage, abundance of water, and refreshments of different sorts."* The island was also visited by Capt. D'Urville and by Capt. Lütke, the latter giving the following account of it:—Ualan is 24 miles in circumference, and is of volcanic formation. A break between two masses of mountains, which extend across the island from West to East, divides it into two unequal parts, the southern portion being more than double the extent of the northern. On this northern portion is *Mount Buache*, so named by Duperrey, which is 1,914 ft. according to Duperrey, or 2,160 ft. according to

* Voyage de la *Coquille*; et Observations sur l'Ile de Oualan ou Strong, par M. Lesson, médecin, &c.; Journal de Voyages, Mai, 1825.

Lütke, above the sea level. From its rounded summit it falls gradually on all sides. On the southern portion, *Mount Crozer*, 2,152 ft. high, was named after the discoverer of the island. Its crest extends N.W. and S.E.; the North flank is very steep and rugged at its summit. In general this portion of the island has many peaks, both isolated and coupled in the form of asses' ears. One of these peaks, more remarkable for its regularly conical summit, and by its position in front of Coquille Harbour, was named *Mertens Monument* by Lütke, after his lamented naturalist.

The northern part of the island is surrounded by a coral reef, which, opening before the break between the mountains, forms a port on each side of the island; that to the West is Coquille Harbour, which Lütke used; that to the East is what the islanders call *Ninmolchon*, and Capt. Duperrey *Lélé*,* from the name of the small island lying in its centre. The southern part is surrounded by a chain of coral islets, connected by reefs, and forming on the side towards the island a shallow lagoon, through which this part of the island may be traversed. The chain is broken towards the southern part of the island, forming a small port, named by the French *Port Lottin*.

The shore, sheltered by the reef from the violence of the waves, is surrounded by a broad belt of mangroves and other shrubs, forming a thick wall of verdure, which at first pleases by its singularity, but its monotony soon fatigues the sight. This belt also, hiding the real shore, renders it difficult to determine the exact limits of the island, and also by its nature renders it constantly liable to change.

In general the whole island, from the sea to the mountain tops, with the exception of the highest and most peaked summits of Mount Crozer, is covered with a thick and almost impassable forest. In the neighbourhood of the houses this wood consists of bread-fruit, cocoa-nut, bananas, and other fruit trees. The break or valley between the two ports is the only part by which you can pass from one side to the other. The distance is only $2\frac{1}{2}$ miles, but the road is unpleasant from the marshy pools, especially after rain.

Rivulets and water-courses are met with at every step. Their number, and the richness of the vegetation, attest the humidity of the climate, unusual in these latitudes. It did not, however, appear to be unhealthy. The villages are chiefly placed along the beaches, but are not much seen from seaward, as they are hidden by the coral islets and mangroves. They are all surrounded with stone walls, separating the properties. The number of inhabitants in the fifty small villages enumerated by Lütke amounted to 409 men and 301 women. They were saturated with disease, introduced by the whalers, and are rapidly on the decrease. Dr. Gulick gives the same numbers as the total population, but in 1882 the inhabitants were said to be only 300 in number. They are described as gentle, amiable, and intelligent.

* "The natives do not pronounce it *Lélé*, but *Lella*,"—Lütke.

Port Lelé', Chabrol Harbour, or Pané Bay of the natives, is where the chiefs and the major part of the population reside, on Lelé Island. It is the most spacious; but as it is on the eastern side of the island, and the prevalent winds are from the eastern quarter, it is not easy to leave it, the more so because there are no soundings in the entrance. It is well protected from the heavy S.W. winds which sometimes prevail. All the dangers are visible at low tide, but, from the muddy nature of the bottom, are not generally seen at high water, especially after rain. In entering, keep in mid-channel southward of Lelé Island, and steer for a reef near the middle of the harbour, which can be passed on either side, and anchor in about 13 fathoms, mud. Supplies of various kinds can be obtained in moderate quantities. This is the harbour usually resorted to by the American whalers.

It was visited by Captain Hammet, in *H.M.S. Serpent*, in January, 1853. The king, who was called King George, but whose proper name was Keru, must have commenced to reign in 1837 or 1838, and was found there by Dr. Gulick. Captain Hammet describes some remains of stone architecture, also alluded to by D'Urville, which were the subject of much speculation. But Dr. Gulick ascertained that they were not ancient, but were built for protection, and in some cases as monuments.

Coquille Harbour, where Duperrey's vessel anchored, is on the western side of the island, which gives it a great advantage over Port Lelé. The sea is here as calm and tranquil as a mill-pond. The anchorage is excellent, and very tennacious, on a bottom of black mud, near two small islets lying in the bottom of the harbour.

The Island of Kusaie or Ualan will serve as an excellent place for refreshment, and particularly for the whalers or vessels proceeding to China by the eastern route; a tranquil harbour, a fine climate, an abundance of fresh water and fruits, are great advantages, all to be enjoyed here.*

The position of the N.E. islet in Coquille Harbour is lat. $5^{\circ} 21' 20''$, long. $163^{\circ} 5' E$. Captain Lütke makes the centre of the island in lat. $5^{\circ} 19'$, long. $163^{\circ} 6'$. Lelé Island is in lat. $5^{\circ} 20'$, long. $163^{\circ} 9'$.

Mackaw Reef.—On October 11, 1856, the ship *Indiana*, Captain Mackaw, discovered a reef awash in lat. $3^{\circ} 20' N$, long. $160^{\circ} 18' E$. Good observations are claimed for this position, as the chronometers were rated 11 days before at Mitre Island. It was about a quarter of a mile in extent, N.E. and S.W. The lookout at the masthead also saw broken patches of water to the eastward; and

* A good supply of yams and fowls can be obtained from the natives. Two vessels were cut off some years ago; but of late the natives have got the name of being friendly and hospitable. Strangers, however, should not allow too many of them on deck; and have their boats armed when wooding and watering.—*Captain Cheyne*, 1848.

another patch of breakers was seen from the forecabin to south-westward about $2\frac{1}{2}$ to 3 miles distant from the ship. A cast of the lead while passing between the two reefs gave no bottom at 12 fathoms.*

PINGELAP, *Musgrave*, or *MacAskill Islands*.—According to Arrowsmith's chart, Capt. Musgrave, in the ship *Sugar-cane*, discovered some small islands, in 1793. They were placed in lat. $6^{\circ} 12' N.$, long. $159^{\circ} 15' E.$ According to Horsburgh, Capt. MacAskill, of the ship *Lady Barlow*, on her passage from Port Jackson to China, discovered, October 29, 1809, two islands covered with trees, extending about 3 leagues N.W. and S.E. By good observations, the centre was found to be in lat. $6^{\circ} 12' N.$, long. $160^{\circ} 53' E.$ Admiral Krusenstern applied the name of *Musgrave Islands* to the first discovery; that of *MacAskill* was given to the second. Notwithstanding the difference of longitude (perhaps owing to the effect of currents), it cannot be doubted that they are the same. Captain Duperrey places Tugulu, the northern one, in lat. $6^{\circ} 14' 30''$, long. $160^{\circ} 52'$.

There are three islands, called *Takay*, *Tugulu*, and *Pingelap* (Pelelep of Duperrey), and together they are not more than $2\frac{1}{2}$ miles in extent, N. by W. and S. by E. They are covered with cocoa-nut trees, are of coral formation, and connected by coral reefs, forming a lagoon inside, with a good ship passage through the reef on the West side leading into it. The group was inhabited by about 300 people, a light-complexioned race, who were not to be trusted; they live chiefly on fish and cocoa-nuts. The reefs produce biche-de-mar, but not in any quantity.

MOKIL, *Duperrey*, or *Wellington Isles*, a group of three coral islands, very close to each other, were discovered in *La Coquille*, June 18, 1824, and named after her commander. The three islands are named *Aoura*, *Ongai*, and *Mokil* or *Mougoul*. The South point of Mokil is in lat. $6^{\circ} 39' N.$, long. $159^{\circ} 53' E.$ They occupy an extent of less than 3 miles, N.N.E. and S.S.W., the islands lying near the inner edge of an extensive reef. There appears to be no entrance to the lagoon.

Capt. Cheyne says they are called the Wellington Isles. They are covered with cocoa-nut trees, and are connected by coral reefs, forming a lagoon, with a passage on the N.W. side. The reefs produce biche-de-mar, and a good supply of cocoa-nuts may be obtained for trifles.

Capt. Hammet, H.M.S. *Serpent*, found, in January, 1853, that an American, named Lucien Huntington, was living on one of the islands, and that the natives (then about 80 in number) were quiet and inoffensive, and quite under his control. He had a flagstaff, on which he hoisted a flag to attract passing ships.

* *Atlantic Island*, lat. $1^{\circ} 10' N.$, long. $164^{\circ} 57' E.$, has been only reported once, in 1827. Its existence and position require confirmation.

A reef, from whaler report, in lat. $2^{\circ} 26' N.$, long. $153^{\circ} 50' E.$, also requires confirmation.

Pigs, fowls, turtle, and taro were procured from him. The only water was rain-water, and the only wood is the cocoa-nut tree.

PONAPI, Ascension, or Sèniavine Islands.—It is very singular that this group, consisting of three separate groups, one of which contains the largest and highest island of the Carolines, should be one of the latest discovered. It was first announced by Capt. Lütke, who saw it January 2, 1828, in the Russian corvette *Sèniavine*, and was named after the officer whose name the vessel bore. But it is more than probable that it had been visited before this.*

The Sèniavine Islands lie between lat. $6^{\circ} 43'$ and $7^{\circ} 6' N.$, long. $157^{\circ} 43'$ and $158^{\circ} 20' E.$ In the principal island the word *Ponapi*, *Bonahi*, *Bornabi*, *Pouynipète*,† or *Painipète*, was constantly pronounced by the natives, and may be undoubtedly recognised as the *Faloupet* of Père Cantova; *Pouloupa*, of which the Ougai islanders spoke to Capt. Duperrey; and *Fanopé*, mentioned by the natives of Kadu to Kotzebue. By the name *Ponapi*, or by that of *Faounoupei*, it is known throughout all the western groups of the Carolines.

The coral reef surrounding Ponapi is $18\frac{1}{2}$ miles in extent, North and South, 17 miles East and West, and about 60 miles in circumference. Ponapi, or Ascension, which gives its name to the group, occupies the centre, and is 12 miles in diameter, North and South, and $14\frac{1}{2}$ miles East and West, occupying

* Captain Cheyne says:—"Near Metalanien Harbour are some interesting ruins, which are, however, involved in obscurity; the oldest inhabitants being ignorant of their origin, and having no tradition bearing any reference to their history. That a fortified town once stood upon this spot, and not built by savages, cannot be doubted; the style of the ruins giving strong proofs of civilization. Some of the stones measure 8 to 10 ft. in length, are squared on six sides, and have evidently been brought thither from some civilized country, there being no stones on the island similar to them. Streets are formed in several places, and the whole town appears to have been a succession of fortified houses. Several artificial caves were also discovered within the fortifications.

"This town was, doubtless, at one time, the stronghold of pirates, and, as the natives can give no account of it, it seems probable that it was built by Spanish bucaniers, some two or three centuries ago. This supposition is confirmed by the fact, that, about three or four years ago, a small brass cannon was found on one of the mountains, and taken away by H.M.S. *Larne*. Several clear places are also to be seen a little inland, at different parts of the island, some of which are many acres in extent, clear of timber, and perfectly level. Upon one of these plains, called K-par, near Kiti Harbour, is a large mound, about 20 ft. wide, 8 ft. high, and a quarter of a mile in length. This must evidently have been thrown up for defence, or as a burial place for the dead after some great battle.

"Similar ruins are to be found at Strong Island, of which the natives can give no account." According to Mr. Doane, an American missionary, they are the ruins of old chiefs' residences; others think they were temples or forts.

* "The first syllable of this word cannot be exactly rendered; it has, in the lips of the natives, a strange and savage sound, extremely difficult to pronounce, and disagreeable to the ear."—Lütke.

nearly the whole of the area enclosed by the fringing coral reef. Besides the chief island, a dozen basaltic wooded islets and rocks surround the island, while on the coral reef are from fifteen to twenty coral islands, resembling the ordinary atolls.

Its highest point, *Tolocolme Peak*, or *Monte Santo*, so named by Lütke, in memory of the naval victory gained over the Turks by Admiral Séniavine, is 2,861 ft. above the level of the sea.

On its N.W. portion is a spot that is entirely flat, from which the land rapidly falls towards the N.W. point of the island, *Cape Zavalichine*, named from Lütke's officer. This is remarkable for a rock about 1,000 ft. in height, nearly perpendicular, and which seems to be of basalt. In other directions the land slopes gradually from the summit to the shore. On the South side is an isolated and very distinct mass of basalt, which, seen from East to West, exactly resembles a lighthouse or a sentry box.

From what could be judged of the principal geological formation of the island, it is, like all the other islands of this sea, of basalt. It is entirely covered with verdure; but it seems less thickly so than Ualan. To leeward, that is, on the South and West sides, mangroves and other shrubs grow in the water, forming an impenetrable border.

There are but very few habitations seen near the sea-shore; the greater part are hidden by the trees, but the smoke rising in numerous points, and the large clumps of cocoa-nut trees, attest the numerous population. The number of people is estimated at 5,000, and they are described as particularly pleasant and good-looking. There is an American mission station here.

The whole island is thickly wooded, and produces many varieties of good timber. The shores are fronted with mangrove trees, which form an impenetrable barrier to boats, except in the rivers, and other small channels among them. Many of these are so narrow as scarcely to admit of oars being used; the houses near the shore have generally one of these channels leading to them.

The Rev. Dr. L. H. Gulick has given an interesting Paper on the climate and productions of Ponapi in the American Journal of Science. In a former page we have made some extracts from this as regards the climate. The following is a description of the group.

Monte Santo, in about lat. $6^{\circ} 53' N.$, is 2,861 ft. high. Several other points approach it in elevation. A somewhat continuous range of hills extends from Uu, of the Waneka district, westward to Paleka, of the Jekoits district, the general line of the range being that of a curve, convex southward. The eastern third, or perhaps half, is narrow and almost equally precipitous on the northern and southern aspects, presenting in many places, as in Uu, perpendicular faces of rock of great height, which show strong columnar tendencies. The middle third of the range slopes very gradually on the southern aspect, where the mountains maintain a comparatively regular descent from their summits to the

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ocean shore, a distance of 5 or 6 miles. Several long narrow valleys run up these slopes, along the sides and at the heads of which are many faces of columnar rock, over which leap the most romantic cascades. Again, the western portion of the range is narrow and precipitous.

A number of detached hills and short ranges still further diversify the scene, more particularly the following. Midway between Metalanien Harbour and Aru Point, there rises a very high hill, of perhaps 1,000 ft., which sends westward a low prolongation connecting it with the main central range. Again, on the North of the island, in the Nut district, there rises a similar mountain, but barely connected with even the mainland. At this place the most perfect basaltic columns are found. The central ridge of Nut is but a prismatic mass, and about its base lie scattered columns of great length, also detached piles of agglutinated columns are found. This must have been, I think, at least one of the spots whence the materials for the Metalanien "Ruins" were taken.

By the course of the main range and the positions of the subsidiary hills, two broad and long valleys are formed. One of them may be called the Metalanien, the other the Nut valley. Each of them may be 4 to 5 miles in width, and 6 to 8 miles in length.

There are several solitary projections of rock in the Metalanien and Kiti district. One, much resembling a sugar-loaf in shape, in the Metalanien valley at the head of that harbour, is called *Takain*. Its height may be 400 ft., and its circumference at the base three-quarters of a mile. Its eastern aspects are perpendicular, its western not so steep but that by adhering with hands and feet it may be ascended. Adherent to the base of the main rock, yet separated from it above, is a much smaller rock. Within a quarter of a mile of *Takain* rises a dome-shaped hill, of almost the same elevation, but not so precipitous. At the head of Panian Harbour a needle-shaped rock elevates itself from the top of a slight ridge. It may be 10 or 12 rods at the base, and perhaps 150 feet high above the top of the ridge. On Lütke's chart it bears the name of *Mount Guérite*; on the French chart *Roic*. In the West end of the island is another needle rock, much like Mount Guérite.

A number of very active streams pour through the valleys on the southern side of the island. The largest is probably that emptying at the base of *Takain*. On the North of the central range there are no streams, save one or two draining the Nut valley. These streams, during the course of ages, must have effected great things. I question whether any bodies of water in the world are more active than these. During freshets, which occur with almost every heavy shower, they are deeply perturbed by the black and red earths with which they are laden. These alluvial substances are deposited along the shores, forming in many places immense flats, over which the tide ebbs and flows. It is only on the South side of the island, from Metalanien Harbour to Point Kittlitz, that these marshes are of any considerable extent, for on this side alone are the principal streams, and these S.W. shores are protected from the

roughened ocean, acted upon by the N.E. trades. The island at the mouth of the Nut valley is but one of the alluvial marshes.

The insulated basaltic points about the main island of Ponapi are very interesting features of the group. *Mutok* (or Tenedos, as named by Lütke), is in reality an island, being only attached to the main land by an extensive alluvial marsh. It is a sort of double hill, rising very precipitously on its eastern aspect 150 or 200 ft. *Jekoits Island* is an irregular triangle, each side being perhaps $1\frac{1}{2}$ mile in extent. Along the eastern border, running North and South, is a high ridge, 800 or 1,000 ft. in height, exceedingly precipitous. The north-western part of the island is elevated from 150 to perhaps 250 or 300 ft., and along its northern and western shores presents very precipitous ascents. The columnar tendency may be seen in most of the ledges of this island, though perfect prisms are rare. *Lungur* and *Poitik* are but points of columnar basalt, about 100 ft. in height, with a *talus* about their bases, their circumference at the water's edge being, perhaps, half a mile. *Parum* is about $1\frac{1}{2}$ mile in length, and in one place half a mile in width, with a central ridge that may be at points 300 ft. in height.

The *Mantapeti*, or *Mants*, rise very abruptly from the water's edge. The smaller of the two is a sort of dome, though presenting in many places faces of perpendicular basalt. About its eastern shore are considerable hillocks of coarse conglomerate. The larger Mant is but the crest of a ridge of prismatic rock that along its whole western aspect presents a very precipitous face, and may be in one place 300 ft. high. *Tapak* is but a repetition of the same, of less elevation. *Takain* rises with much of the usual perpendicularity to the height of perhaps 300 ft. The mass of its hill is of a reddish rock; and in certain spots a red earth is found which makes an admirable paint for native canoes; a substance that is also found in almost every part of the main island. *Mutokaloj* is about 50 ft. in height, and is very small. Only on the margins of this islet have I succeeded in finding anything approaching to cellular lava. *Taman Island* has a general level of about 75 ft., and descends quite steeply to the water on nearly every side. Near it, to the South, are several very small and low basaltic islets.

It need scarcely be remarked that the general surface of all the basaltic members of the Ponapi group is very rugged. Rocks and stones are scattered over almost the entire surface in the greatest profusion; and but few plains, even of a few acres in extent, are to be anywhere seen. The leeward slopes in the *Kiti* district present a few spots that may be termed level. Basaltic specimens may be found on almost every square rod of the island, but on certain spots they seem to be adventitious rather than native. In such spots the earth is a reddish clay, under which will usually be found what seems to be a decomposed rock with frequent seams of red earth. Beneath the whole we strike upon the substratum of basalt, in compact masses.

Surrounding the whole body of basaltic elevations is a beautiful coral reef,

land at the mouth of

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distant from the coast of the main island the average distance of perhaps 2 miles. There are no less than *seven considerable intervals in the continuity of this reef, forming as many harbours, several of which are really excellent.* Between the reef and the shore of the island are all the usual coral patches that give such wondrous variety to tropical waters. On the outer reef are a number of islets in every respect similar to those on the purely coralline groups. They are found from the mouth of Metalanien Harbour, along the southern line, as far as Point Kittlitz, but not on the North of Ponapi. These islets have a nearly uniform elevation of about 2 ft. above high-water mark. I gather from my own observations, and from the reports of the pilots, that soundings are found outside of the reef, nearly if not quite round the island, at distances varying from a quarter to half a mile from the reef.

Of its harbours Capt. Lütke has given us no account, as before stated. He sent Lieut. Zavalichine, January 3, 1828, to examine one, at the South end of the island, in an opening of the reef, and leading towards what is marked on his charts as *Mounts Tenedos* (Mutok) and *La Guérite* (the sentry box), before alluded to.

Kiti, or Rono Kiti Harbour.—Capt. Cheyne first described this harbour in 1848. It is the one most resorted to by American whalers. Its entrance is in lat. $6^{\circ} 48' N.$, long. $158^{\circ} 7' E.$ A vessel bound to this harbour from the eastward, from December till April, should endeavour to get into the latitude of the island as soon as possible, after passing the Duperrey Isles, and continue running to the westward on the same parallel of latitude, until the island is sighted, as strong westerly currents prevail at times during these months, with much hazy weather; and a stranger would be liable to get set past the island, if a proper allowance were not made for the current. After making the land, continue steering to the westward, until the reef is visible from the deck; at which time, if the weather be moderate, it is presumed a pilot will be alongside.

The harbour forms a snug basin, where a ship can lie as safe as in a dock. The entrance, however, is very narrow and intricate; the narrows for about 200 yards being only 40 fathoms wide. The outer entrance is between the two small woody islands named Nalap and Namaur, the latter a sandy islet with bushes on it, situated on the reef, to the eastward of the former. The channel is 4 cables wide, between Shaulak or Little Nalap and the sandy islet. The largest Nalap Island is $2\frac{1}{2}$ cables in length, North and South, and the inner one two-thirds of a cable in extent. Namaur, on the East side, is about three-quarters of a cable in length. The distance from the entrance to the narrows is nearly a mile North (true) mid-channel. In entering, the elbow of the barrier reef to the southward of Namaur Islet, should have a berth of $1\frac{1}{2}$ cable, as a coral spit extends from it some distance. In the middle of the outer bight or harbour, the depth is 45 fathoms, decreasing gradually towards the narrows, where it ranges from 10 to 15 fathoms. A detached sunken rock, with only 4

THE CAROLINE ARCHIPELAGO.

feet on it, lies in the outer entrance of the narrows, and must be left on the port hand going in. The course through the narrows is N.W. $\frac{1}{2}$ W. (true). When inside, the water deepens to 20 and 25 fathoms, and then gradually shoals to the anchorage at the head of the basin. The harbour or basin is 7 cables in length, N. by E. and S. by W. (true); and between the narrowest part of the reefs which form it, $1\frac{1}{2}$ cable in width. The best anchorage is at its head, in 7 or 8 fathoms, where the port has a diameter of 2 cables each way, without going under 5 fathoms. The reefs which form this harbour dry at low water, spring tides, on each side, and at the head of the basin.

Kiti or Roan Kiddi River is about a quarter of a mile from the anchorage, from whence a plentiful supply of good fresh water can always be procured, and an abundance of firewood can be easily obtained on the low land, at the mouth of the river. It is high water at this place, on full and change, at 4^h ; the rise is $5\frac{1}{2}$ ft. A stranger before attempting to enter must send a boat in, and place buoys on the rocks and East side of the channel.

By having a careful officer at the masthead, when running in, all dangers can be seen and avoided in a clear day. The best time to enter is on the first of the flood; as, should a vessel unfortunately get on shore, through a sudden shift of wind, while passing the narrows, she will stand a much better chance of getting off without injury than at any other time.

The ensuing remarks are from the remark-book of H.M.S. *Larne*, 1839:—
 "After passing an outer bight or bay, formed by the outer reefs, in which there is nothing less than 45 fathoms, a N.W. course leads for the inner passage, which, for about 200 yards, is 80 yards wide between a sunken rock, with 4 ft. on it on the port hand, and the line of the inner reef very steep-to (7 fathoms), which should be hugged as closely as possible. The course through the narrows is N.W. by W.; but a fixed course or marks are unnecessary, as a ship would always pass in and out as the *Larne* did by the deep water, as distinguished by the eye when conned from the fore-top-gallant mast-head. The ordinary N.E. trade is a leading wind in, with very smooth water, and when through the narrows, it is requisite, if possible, to shoot to starboard round the tongue of the reef, clewing all up, and anchor in 22 fathoms. Then warp to northward up the pool to any depth, from 20 to 7 fathoms, which it is best to do evening or morning when the wind drops.

"At the *Larne's* anchorage we found the lat. $6^{\circ} 48' N.$, long. $158^{\circ} 7' E.$ (corrected). High water, on full and change, at 6^h ; the rise was $4\frac{1}{2}$ feet."

This anchorage was surveyed by Lieutenant G. S. Reynolds and Mr. R. Edwards (mate), of H.M.S. *Larne*. It is a perfect pool, with strong clay holding ground. To the northward is a fine stream of fresh water, which boats can only enter an hour before and after high water. The best place for filling is about half a mile up, near a hut where the natives make nets and repair canoes. Just above this spot the clear fresh water descends in a torrent. Another port is on the North side of the island. Captain Lütke says:—

"Before the N.W. point of the island, remarkable for the high basaltic rock, we saw a large opening in the reef, and beyond that an extent of water which promised a good harbour. I determined once more to find a convenient anchorage. Our boats found a passage $2\frac{1}{2}$ cables in width, and 25 fathoms in depth, and beyond that, to all appearance, an extensive and safe harbour. But hardly had they passed the entrance channel before they were met by canoes full of natives, who surrounded them in an instant in a most turbulent manner. Rather than come to extremities with them, the boats returned to the corvette. It is possible that these natives had no hostile intentions, but their conduct was such that the search was given over." This harbour was called *Unwelcome Harbour* (Port du Mauvais Accueil) by Capt. Lütke, from his reception by the inhabitants.

Lod Harbour, another small harbour—much used by whalers, on account of being able to sail in and out with the prevailing N.E. wind—is on the S.E. side of the island. The entrance is through a break in the reef, and the anchorage between that and the mangroves which front the shore.

There is another harbour at the N.W. part of the island, in front of the high perpendicular cliff which terminates the island of Jecoits or Joquoits to the N.W. The entrance is through an opening in the barrier, about 2 cables wide, but the water inside is very deep, from 25 to 30 fathoms. Capt. Moore says that Jecoits Harbour is difficult and unsafe to attempt, and in this he was confirmed by examining it in a boat.

Metalanien Harbour, or *Port Metalamin*, on the East side of the island, is perfectly safe, and sheltered from all winds. It has a wide entrance on the North side of *Naa Island*, and the only hidden dangers to be avoided when running in are a sunken rock, some distance within the entrance, and two other shoals of 3 to 9 ft., farther to the westward, all nearly in mid-channel. The sea sometimes breaks on the outer rock; but it can always be avoided by keeping the starboard side of the channel close aboard. The barrier reef at this place extends a long distance from the main land, and between are many coral flats. The harbour is formed by the main land, and is similar in shape to a horse-shoe, and the channel leading to it runs nearly in a direct line W.S.W. from the entrance to the head of the harbour.

The three detached shoals in this harbour are most difficult to see, even at low water and with a good light. They were not visible from the mast-head of H.M.S. *Espiègle* when entering the harbour, but were afterwards found to be correctly placed on the plan; their surface being the same colour as the water, they were not easy to see even when close to in a boat. The North point of Tauche Island, on the South side of the harbour, was found to be in lat. $6^{\circ} 51' N.$, long. $158^{\circ} 18' E.$ —H.M.S. *Espiègle*, 1833.

This harbour may be easily recognised from seaward by a remarkable peaked hill, resembling a spire or sugar-loaf, on the North shore within the harbour.

North Pacific.

G K

An abundant supply of firewood and excellent fresh water can always be obtained here.

Strong N.E. winds prevail from December to April, with much hazy weather and frequent squalls, attended with rain. During these months strong westerly currents are very frequently experienced. From March to August the winds are generally light and variable, but chiefly from the eastward, with much fine weather. In September, October, and November, strong westerly winds, with severe squalls and rain, may be expected; and strong easterly currents are frequently found during these months. On the whole, the climate must be considered very moist, as scarcely a day passes without rain, especially in winter.

The officers of H.M.S. *Larne* made the following observations on this harbour:—It is highly advisable that no square-rigged vessels of any magnitude should enter this harbour. The passage is narrow, with two rocks in it at different angles, and as it fronts directly to the N.E., from whence the trade wind is perpetually blowing, a heavy swell rolls in incessantly, and there being no soundings outside the reef, it is dangerous in beating out in case of the wind dropping, and boats are useless for towing on account of the heavy swell. It was entirely owing to these circumstances that the whaler *Falcon*, of London, was wrecked in her attempt to beat out in July, 1836, after having been three months wind-bound inside.

The *Ant* or *Andema Group*, the second cluster of the *Séniavine Islands*, lies about 7 miles S.W. of Ponapi Island reef. This is the group said to be discovered by Captain Fraser, of the ship *Planter*, in 1832, and named by him *William the Fourth Group*, and in some charts *Fraser Islands*. But the discovery in the *Séniavine* being prior to this, the credit is due to Captain Lütke. When first approaching it, January 5, 1828, he was nearly being drifted on to them by a calm which overtook him; this was caused by the high land of Ponapi interrupting the trade wind, but did not prevent the heavy swell from rolling onwards. This incident may serve as a caution. He says that the group is composed of a dozen coral islands of different sizes, covered with a thick verdure. There was no appearance of habitation, but they were visited at times, for they saw in one part a pile of stones raised on a large blackish rock. The reef is of a triangular form, and is about 8 miles long on each side, the islands occupying that facing the S.E. The South island is in lat. $6^{\circ} 44' N.$, long. $157^{\circ} 53' 30'' E.$

Capt. Cheyne, of the *Naiad*, calls them *Ant Islands*, and says they form a group of four large, low, coral islands, covered with cocoa-nut and bread-fruit trees, and surrounded by a coral reef, forming a lagoon inside, with a passage between the two large islands.

These islands belong to the chiefs near Kiti Harbour. They have no permanent inhabitants, but are resorted to from May till September, for the hawks-bill turtle fishery. They are also visited at other times for supplies of cocoa-nuts and bread-fruit.

The Pakin or Peguenema Group, the third and westernmost of the Sóniavine Islands, is composed of five small islands, extending about 5 miles, N.W. and S.E. The S.E. island is named *Katelmá*, and its East point is in lat. $7^{\circ} 2' N.$, long. $157^{\circ} 47' 30'' E.$ The next lies $1\frac{1}{2}$ mile to the northward, and is called *Ta*; the next is *Tagaik*, lat. $7^{\circ} 4' 4''$, long. $157^{\circ} 47'$. *Kapenoar*, or *Kapenuare*, is the westernmost and largest, its West point being in lat. $7^{\circ} 4' 40''$, long. $157^{\circ} 44'$. In the Nautical Magazine, November, 1848, they are called *Pakeen*, and the following is the account there given of the group:—

It is composed of five small islands surrounded by a coral reef, forming a lagoon inside, into which there is no passage through the reef. The westernmost island is inhabited by a Ponapi chief, his family and servants, in all about thirty souls. The lagoon affords plenty of excellent fish. This place is celebrated for its canoe sails, which are manufactured from the leaves of the pandanus tree, and are eagerly sought after by the natives of Ponapi. Poultry are also plentiful. In fine weather the natives, who are about 100 in number, frequently visit Ponapi in their canoes.

NGATIK (Ngaryk), or *Valientes Islands*, is a small group of eight coral islands, the East extreme of which is in lat. $5^{\circ} 47' 30'' N.$, long. $157^{\circ} 32' E.$ They were discovered, in 1773, by the Spanish navigator Don Felipe Tompson, who called them *Los Valientes*. He made a plan of them, which was found by Capt. Lütke to be tolerably accurate, but $1^{\circ} 4'$ too far East. They were seen, in 1793, by Captain Musgrave, in the *Sugar-cane*, who called them the *Seven Islands*; and in the year following they were passed by the *Britannia*, and named the *Raven Islands*. Captain Don Joachim Lafita saw them, and determined their position in 1802. They were surveyed, in 1828, by Captain Lütke, whose account follows:—

The group is of a triangular form, and is 22 miles in circumference. We counted eight islands, and not seven as marked on Tompson's plan. We found a continuous reef surrounding the whole of the group, without having the least passage into the lagoon. It would be curious to know if Tompson was mistaken in marking an opening on the South side by which the natives passed in their canoes, or whether this opening has become closed in the course of fifty-five years by the zoophyte architects. On all the islands a large quantity of cocoa-nut trees grow; the South side of the northernmost island is quite covered with a forest of these trees. Notwithstanding this, we saw no traces of inhabitants except on the small island at the western angle. Tompson saw people on the eastern islet, and canoes in the lagoon. We were surprised at the entire absence of the latter. This was more strange, as a large quantity of bread-fruit trees, from which they make their canoes, were seen; and, besides this, a large quantity of drift-wood lay on the shore. The population must be very slight. It was supposed that the thirty men seen together on the westernmost island formed the entire population.

Mr. Doane visited this group in 1874, in the missionary vessel *Star*. He

states there is a boat entrance to the lagoon near an islet on the eastern extremity of the reef. The islands are fertile, producing bread-fruit, cocoa-nuts, sugar-cane, bananas, &c.—*Geographical Magazine*, August, 1874, pp. 203-5.

NUKUOR (Nougouore), or *Monteverde Islands*.—This group, which lies considerably to the South of the general line of the Caroline Archipelago, was discovered, in 1806, by Don Juan Bapt. Monteverde, commanding the Spanish frigate *La Pala*. The first or native name is that applied to them by Captain Lütke, though he did not see them.

They were seen by Capt. R. L. Hunter, December 10th, 1840. They form a group of small, low, coral islands, covered with cocoa-nut and other trees, and connected by a reef, forming a lagoon inside, the whole group being only about 12 or 14 miles in circumference. They are inhabited by a fine, handsome race, who are above the mean stature, and resemble the natives of the Navigator Islands in appearance; in 1874 they numbered about 150. Their canoes are neat, and capable of carrying 12 men. The centre of the group is in lat. $3^{\circ} 52' N.$, long. $154^{\circ} 56' E.$

There is only one passage into the lagoon, and that is on the S.E. side; it is about 20 yards broad, and has been used by trading schooners. The tide runs strongly through it, the ebb forming a heavy race outside dangerous to boats.

Matador Island.—In 1876 the master of a British schooner announced the discovery of a group of fifteen small coral islands on an atoll, in lat. $1^{\circ} 30' N.$, long. $157^{\circ} E.$ (approximate). One of the islands was inhabited; the natives were very shy, and said the island was named Matador. This may be *Spartan Island*, reported by the American ship *Spartan*, in lat. $1^{\circ} 10' N.$, long. $159^{\circ} 30' E.$

GREENWICH or Constantin Island.—This isolated spot was seen in 1825, and then had the first name applied to it. It was again reported in the Nautical Magazine, 1852, page 226, and was considered as doubtful. It was then seen on December 20th, 1853, by Capt. Tardy de Montravel of the French Marine, who has done great services to hydrographical science, in the French ship *Constantin*, bound to New Caledonia. They were again seen by Captain W. Symington, in the *Northfleet*, 1864, and from the Spanish frigate *Berenguela*, 1865. Still more recently they have been seen and described by Capt. Hamilton, barque *Fire Queen*, 1877. Their native name is *Kapinga Malany*.

The group forms an atoll similar to Nukuor, having twenty-eight small, low, coral islets, covered with cocoa-nut trees, on its eastern side, the western side being coral reef. The reef is triangular in shape, with its base to the northward, and is about 14 miles in extent North and South, and 8 or 9 miles East and West, enclosing a lagoon. Only two islands are inhabited, both at the S.W. portion of the group; on one of these is a mound about 80 ft. high,

formed of dead coral. At the eastern extremity of the reef is a sand-bank. On the South side there is a boat entrance to the lagoon, about 1 mile westward of the western island. The East end of the group is in about lat. $1^{\circ} 4' N.$, long. $154^{\circ} 45' E.$ *

ORALUK, San Agustino, or Bordelaise Island.—This is a small, low, coral island, 2 miles long, and about 100 ft. high, with a reef projecting from it to the S.E. for 18 miles. It was perhaps discovered, in 1826, by Capt. Saliz, commanding *Le Péruvien*, of Bordeaux. The reef forms a lagoon inside it, and from its S.E. part the island cannot be seen; it is, therefore, very dangerous. The island is in about lat. $7^{\circ} 36' N.$, long. $155^{\circ} 9' E.$

Several discoveries are stated to have been made in this immediate neighbourhood. *Jane Island*, by Capt. Johnson, of the ship *Guilford*, in October, 1827, in lat. $7^{\circ} 33' N.$, long. $155^{\circ} 3'$. His description, which accords very nearly with that of Capt. Saliz, is that of a low island, half a mile in length, with a very dangerous reef running off the S.E. extreme to the distance of 5 miles, and a chain of rocks extending to the E.S.E., as far as could be seen from the mast-head. Near the East extreme lies *Baxo Trista*, 50 ft. high.

Isabella Reef, so called from the wreck of a whaler of that name, was said in the usual vague manner to be 80 miles long, and in lat. $7^{\circ} 21' N.$, long. $156^{\circ} 30' E.$ Mr. Bray, of the *Morning Star*, 1880, states that he sighted a small reef, which had a low growth of bushes on it, in lat. $7^{\circ} 25' N.$, long. $156^{\circ} 28' E.$ Capt. Hamilton, of the *Fire Queen*, 1866—1872, states that he passed this position on three occasions, no signs of a reef being visible. *Amicitia Island*, in lat. $7^{\circ} 35' N.$, long. $156^{\circ} 45' E.$, is another doubtful announcement. That the neighbourhood requires examination, the following will still further demonstrate.

Another is *Larkins* or *Campbell Reef*, a dangerous reef discovered by Capt. W. Campbell, of the ship *Larkins*, February 23, 1830. The N.E. point is placed in lat. $7^{\circ} 36' N.$, long. $155^{\circ} 10' E.$ He did not see the small island, but says it is 14 miles E.S.E. of Bordelaise Island. *Meaburn Island*, in lat. $7^{\circ} 49'$, long. $155^{\circ} 20'$, must be the same. San Agustino Island and Baxo Trista, discovered by Don F. Tompson, which, though placed by him 2° to the East, would appear to be the same; more particularly, as, should the position have been correct, he would have been within sight of the high Sériavine Islands. Lütke discovered an error of $1^{\circ} 4'$ in the longitude of Los Valientes, which would reduce the discrepancies to 1° , which Admiral Krusenstern considers ought not to be considered as decisive.

* DECAPOLES REEF, reported to have been seen from the vessel of that name, in May, 1869, at half a mile distance, in lat. $0^{\circ} 32' N.$, long. about $152^{\circ} 51' E.$, seemed to be of small extent, and the sea, although smooth at the time, broke occasionally over it. It is doubtful whether it exists.

Bordelaise Island, therefore, it is very probable, is the only island. It is covered with bushes and palm-trees, and can only be seen 10 or 12 miles. M. Edw. du Pernet, master of an Oahu schooner, was wrecked on its reef in 1843, and remained on the islet five months, during which time they built a small craft which carried them safe to Guam. He was pretty certain that no other island existed near it. The island is uninhabited, but we cannot be certain of its character, or of the authenticity of the various announcements, till a further examination is made.

Wishart Reef, Minto Breakers, or Costello Reef.—On January 3rd, 1842, Capt. J. R. Wishart, in the barque *Countess of Minto*, saw a patch of breakers, dry in some places, more particularly in the North part, extending in a N.W. and S.E. direction. He made it in lat. $8^{\circ} 10' N.$, long. $154^{\circ} 19' E.$ (corrected). It was again seen by Capt. Agostinho Costello, in the Sardinian schooner *Sofia*, November 27, 1854; a wreck, with only the bowsprit and jibboom, was lying on the East part. It was described as of an elliptical form, 7 miles long, East and West, and 2 miles broad, North and South. Except the small portion at the point where the ship lay, it was awash, or some feet under water, when the sea breaks all over it. Lat. stated $8^{\circ} 6' N.$, long. $154^{\circ} 0' E.$ It was again seen by Capt. Richards, in the Siamese ship *Ocean Queen*, July 25, 1855, the wreck still lying on it. The position of the latter was lat. $8^{\circ} 6' N.$, long. $154^{\circ} 20' 30'' E.$ It was again seen by Capt. Webb, in the ship *Mildman*, in 1858. He saw two wrecks on it, and places the West end of it in lat. $8^{\circ} 8' N.$, long. $154^{\circ} 29' E.$

From an announcement in the San Francisco Herald, a reef, 10 miles long, lies in lat. $7^{\circ} 56' N.$, long. $154^{\circ} 20' E.$ All these announcements evidently refer to the same reef, and are tolerably accordant. The mean of the five positions, supposing them to refer to the South end, as they appear to do, would place it in about lat. $8^{\circ} 5' N.$, long. $154^{\circ} 17' E.$

Dunkin Reef, seen, in 1824, by the person whose name it bears, is marked as an extensive shoal, the South end of which is in lat. $8^{\circ} 50' N.$, long. $154^{\circ} 10' E.$ It is possible that it may be the same as Wishart Reef, but as another announcement, by a whaler, places it nearly in the above latitude, or $9^{\circ} 0' N.$, 55 miles northward of the mean latitude of the former, it must be considered for the present as a separate danger, of unknown extent and character, but its South end in about lat. $8^{\circ} 55' N.$, long. $154^{\circ} E.$

LOSAP (Lousappe) is a small island, discovered and named by Captain Duperrey, in lat. $6^{\circ} 53' N.$, long. $152^{\circ} 42' 20'' E.$ In the second volume of Admiral Krusenstern's Memoir (p. 347) it is called *Duperrey Island*, but this was before the publication of that commander's voyage. They are called the *Westervelts Islands* by the apocryphal Capt. Morrell, who believed them to be a new discovery, February 23, 1830. He says they seem to be composed of three small low islands, of nearly equal size, connected by a coral reef. They are well wooded with cocoa-nut and bread-fruit trees. They were neither of them more than 5 miles in circumference, and had biche-de-mar and pearl-

oysters on the reefs. In 1874 the population was thought to number about 500.*

Losap is a beautiful lagoon, free from shoals, and has a depth of about 16 fathoms. There is a narrow passage upon the eastern reef very much like that at Ebon, and it should be used only in the same manner. Upon the western reef are there six passages; some of them, however, have rocks in them with not more than 2½ and 3 fathoms on them, and one I found with only 9 ft. The best passage is the one to the South of the only large sand-bank upon the reef. At the N.E. end of the lagoon there is a small lagoon within the lagoon; there is good anchorage there in 8 fathoms. *D'Urville*, properly called *Nama*, is a small island 12 miles N.W. of Losap, without any lagoon, and considerably higher than most coral islands. It has no anchorage.—(*Mr. J. Bray*.) It is thickly wooded with bread-fruit and cocoa-nut trees, and has about 150 or 200 inhabitants.

The eastern Losap Island appears to be in about lat. 6° 53' N., long. 152° 42' E., and D'Urville Island in lat. 6° 59', long. 152° 33'.

MORTLOCK ISLES were discovered November 29, 1793, by Capt. James Mortlock, commanding the ship *Young William*. Admiral Krusenstern applied the name of the discoverer to them, while on other charts the name of his vessel is given. Mortlock only saw their South side, and consequently gained a very imperfect notion of them. This is obviated by the examination made by Capt. Lütke. He surveyed the group, and they are considered as separate islands in Dr. Gulick's list, consisting of *Lukunor*, *Sotoan*, and *Etal*.

Capt. Cheyne says that these islands are well inhabited by an able-bodied race, of a light complexion. Strangers should be very cautious in holding intercourse with them, as they are *not to be trusted*, no matter how friendly they may appear. Under no consideration should any of them be allowed on deck. Mr. Doane, however, states that his experience does not agree with this, the natives being very friendly during the stay of the *Star*.

The following are Lütke's description of them:—Between the lat. of 5° 17' and 5° 37' N., long. 153° 59' and 153° 37' E., are three low coral groups, on which may be reckoned ninety islets of various dimensions.

LUKUNOR (*Lougounor*, Lütke—*Lugunor*, Cheyne), the easternmost of these groups, is of an oval form, and about 18 or 20 miles in circuit. *Lukunor Island*, at the eastern angle, is curved into the form of a horse-shoe, and forms on its West side an excellent port, named *Chamisso*, in honour of the naturalist who gave to the world the first notions worthy of credit on this archipelago.

* SAN RAFAEL ISLAND of Captain Montevorde, 1806, and so named by Duperroy, is placed in 7° 18' N., long. 153° 54' E., or 76 miles to the E.N.E. of Losap Island. It is not enumerated in Dr. Gulick's list, and there is some doubt as to its existence. If not, it is possibly the same as the latter island, or D'Urville Island, as the descriptions in some degree coincide.

The greatest breadth of the island is one-third of a mile, and its middle, raised about 7 ft. above the sea, is covered with bread-fruit trees, and, on the shores particularly, cocoa-nut and other trees. The southern part of the island is sandy, but towards the North there is much vegetable mould, on which are the arum plantations, which require a very humid soil, and near to which are all the habitations of the natives. These plantations are intersected by narrow channels, which conduct the water to irrigate all parts, and serve as boundary marks. The woods which surround them form a magnificent panorama, where plants of every species are in infinite variety, giving the most excellent idea of the productions of these low islands.

The island naturally has no fresh water, but the rain-water is collected in trenches and in excavations in the trunks of those cocoa-nut trees that are inclined. The water in the trenches was always found to be brackish, and smelt bad. This slight resource suffices for the inhabitants, inasmuch as they drink but little, and the cocoa-nut supplies the deficiencies by its delicious contents.

The Lukunorians were found by Capt. Lütke to be hospitable, kind, reserved, and of agreeable manners; they are above the middle size. Their canoes are constructed with infinite pains, and are very carefully preserved; and in their management they show great skill and judgment in the very long voyages which they undertake. These islanders are the easternmost of the Caroline natives who thus travel.

Lukunor offers no more resources than any other of the low coral islands. A good supply of cocoa-nuts may be looked for; bread-fruit can only be had in the season. Some poultry and pigeons were also procured. In 1874 the population was about 1,600.

Port Chamisso.—The entrance to this anchorage is between the West end of Lukunor Island and the East end of Siapunor Island; it is about $2\frac{1}{2}$ cables wide, with 22 to 12 fathoms in it. To enter, keep close round the West end of Lukunor Island, and then steer E.N.E. for the anchorage in 12 to 10 fathoms, fine sand. The observation spot, 6 cables from the West end of Lukunor Island, is in lat. $6^{\circ} 29' 18''$ N., long. $153^{\circ} 58'$ E.

"Here we find, if I mistake not, the gem of the coral islands in Micronesia. The lagoon, comparatively free from coral patches, and the islets fertile, and so situated as to protect the anchoring ground, which has a fine bottom, and close in to the shore if needed, and not deep, the contour of the atoll, the mildness of the people, all combine to make this a beautiful island. There is but one passage, though easy of access, on the South side."—*Mr. Doane.*

The SOTOAN GROUP, to the S.W. of Lukunor, is 17 miles in length, N.W. and S.E., and 12 miles broad; about sixty islets were counted on it. Two passages offer access to the lagoon, one on the South side, and the other on the North; the lagoon is stated to be very free from coral patches. All the islets are covered with wood, the bread-fruit, cocoa-nut, and pandanus being

abundant. Only two or three canoes approached the *Séniavine*, but no communication was held with them.

Capt. Cheyne, in the *Naiad*, visited the islands in October, 1844. He found a good passage through the reef, on the S.W. part of the group, and anchorage in the lagoon, near the entrance, but the bottom was very uneven and rocky. The *Naiad* anchored in 25 fathoms, about three-quarters of a mile to the northward of the entrance, inside of a small islet bearing S.W. from her one-quarter of a mile, and lay there three weeks, during which time they built a biche-de-mar house on the small island, but could not get the natives to collect the slug, and consequently were obliged to leave. In 1874 the population was computed to be about 1,500.

The West end of Ta Island, on the East side of the southern pass, is in lat. $5^{\circ} 17' N.$, long. $153^{\circ} 46' E.$

The **ETAL GROUP** is the third and northernmost of the Mortlock Isles; it is a small group, not more than 12 miles in circumference, and composed of several low coral islands and islets, thickly wooded, connected by a reef, forming a lagoon, with no entrance for ships. The channel between it and Sotoan is about 3 miles wide, and clear of danger. The centre of the group is in about lat. $5^{\circ} 35' N.$, long. $153^{\circ} 43' E.$ In 1874 the population was about 600.

NAMOLUK ISLANDS lie about 33 miles to the N.W. of Lukunor, and were discovered by Capt. Lütke. In coming from the North, the *Séniavine* passed them, at the distance of less than 12 miles, which shows how readily these islands may be unnoticed even within such a distance. They were also probably seen by Capt. Harwood, in the ship *Hastings*. They are most likely the same as the *Hashmy Islands* (called by Dr. Gulick *Mokor**), announced as being very populous in the Sydney Herald, March 25, 1833. Capt. Cheyne, of the *Naiad*, says they are five in number, the group 15 miles in circumference, of a circular form, 100 ft. high (to the top of the trees?) and well wooded with cocoa-nut, bread-fruit, and other trees. The reef may be approached within 200 yards, as no hidden dangers exist. The natives, he says, though wearing the mark of friendship, are by no means to be trusted. In 1874 the population was estimated to number from 300 to 500. There is only a boat passage into the lagoon. Amesse, the southern island, is in latitude $5^{\circ} 45' 15'' N.$, long. $153^{\circ} 16' 30'' E.$

TRUK OR HOGOLEU ISLANDS.—This group is composed of four or five large and lofty basaltic islands, surrounded by a barrier reef, on which are a great number of coral islands. It is one of the most extensive in the Caroline Archipelago, and was discovered by Captain Duperrey, June 24, 1821. His

* *Mokor Island* (lat. $5^{\circ} 41' N.$, long. $152^{\circ} 40' E.$) I could not find, though I searched for it. I have been told by trading captains that it is certain there is no island there.—*Mr. J. Gray*, of the *Morning Star*, 1880.

survey, published on a large scale in the atlas of his voyage, comprises almost the sum of our knowledge of them, as the relation of his voyage, as far as concerns this part of the Pacific, has not been published. The northernmost of the group, *Pise Island*, is in lat. $7^{\circ} 42' 30''$ N., long. $151^{\circ} 46'$ E.; the southernmost, *South Island*, in lat. $6^{\circ} 57'$, long. $151^{\circ} 57' 30''$; *Torres Island*, the westernmost, in lat. $7^{\circ} 20'$, long. $151^{\circ} 24'$; and the easternmost, in lat. $7^{\circ} 20'$, long. $152^{\circ} 0' 30''$. The largest of them, *Tol*, is not more than 10 miles in circumference; it is of very irregular form, and on each of its projections is a hill, that to the S.E. being 700 ft. high. At 12 miles to the East of it is *Ruk*, 4 miles long, and 700 ft. high.

Tsis Islet is three-quarters of a mile in extent, covered with cocon-nut trees and other wood. It has anchorage to the N.W. of it, and plenty of fresh water can be procured on the North side. Its North point is in lat. $7^{\circ} 18' 30''$ N., long. $151^{\circ} 48' 30''$ E.

The *Royalist Islands* of Captain Cheyne are probably the S.E. extreme of Hogoleu. He passed 7 or 8 miles to the eastward of them in October, 1844, and thought them a distinct group, as no part of the larger islands was visible. They are low, of coral, covered with wood, and enclosing a lagoon. They were thickly peopled by a vigorous race.

This southern group is a reef of rectangular form, about 12 miles long, N.W. and S.E., and 5 miles broad; inside this reef (on which is the island of Givry on the North, Haq Island on the N.E., Lauvergne Island on the S.E. side, and South Island on the extreme South corner) is a large clear lagoon, with one entrance on the S.W. side. The *Blanche* steamed along the S.W. and N.W. sides, crossing the true Hogolu barrier reef in long. 152° E., carrying from 7 to 8 fathoms, with shoal patches nearly awash on either side, and anchored in 17 fathoms off the N.W. end of Tsis Island. The natives were quite naked, armed with spears and slings, are savage, and not to be trusted. On weighing, with the intention of examining the group to the northward, found it full of shoals, and, the weather being unfavourable, stood out of the passage in the Hogolu barrier reef, bearing S.W. from the anchorage off Tsis Island, with no bottom at 17 fathoms; found the longitude, as marked in the Admiralty chart, about 8 miles too far to the westward.—*Captain Simpson*, H.M.S. *Blanche*, 1872.

Capt. Morrell gives a glowing picture of the people, but unfortunately it is not correct. Capt. Cheyne, in the brig *Naiad* and *Will-o'-the-Wisp*, came here in October, 1844, to collect biche-de-mar, and were completely taken off their guard by the apparent friendliness of the natives, who at first assisted them to build their curing-houses. As soon as the brig left, they attacked the schooner with a force of 2,000 men, and were only repulsed with desperate fighting, and the loss of six killed and five wounded. They also seized the long-boat, which was recovered the same day, and a severe drubbing administered. They had a

great number of large Spanish knives, and were armed with brass-hilted cutlasses. The population, according to Dr. Gulick, was 5,000.

The following more recent account is by Mr. J. Bray, of the missionary packet *Morning Star*, 1880.

The Truk, or Hogolu group, is in a vast lagoon like a large lake in the sea, and is a beautiful place. There are ten high islands in the lagoon, varying from 10 to 15 miles in circumference, and from 200 to 1,000 ft. high, and scores of smaller ones are found throughout the lagoon and upon the surrounding reefs. Givry, Haq, Lauvergne, and South Islands are upon a separate reef, enclosing a lagoon into which there seemed to be a passage at the S.E. and N.W. Between the two groups there is a wide clear passage with deep water and a strong current running West.

Following up the eastern reef, we came to a good passage through the reef about 300 yards wide, having a bank of 5 and 6 fathoms across its mouth, and a good-sized island on its South side, called by the natives Woies Island, probably Caplin Island of the charts. On the North side is a small islet, or I might say it is in the passage, as there is a small passage North of that again. At $3\frac{1}{2}$ miles North of this there is another good passage about half the width of the preceding; the island just South of it is named Chassant, the natives call it Silat. At 14 miles farther North, in lat. $7^{\circ} 30' N.$, there is a splendid passage a mile or more wide, with 15 fathoms of water, but just inside is a small 3-fathoms bank. There are tide-rips in the passage during the N.E. trades. At the North end of the lagoon the natives reported three more good passages—the first 11 miles North of the last-mentioned; also a passage at each end of Pise Island.

Between Cuop Islands and Falau Islet there are five other passages through the reef. The best is the first one East of Falau Islet, this islet being a good mark to steer for, as it stands alone, and is well covered with high wood. I think good anchorage can be found almost anywhere in the lagoon. The soundings we took varied from 15 to 27 fathoms. We anchored near the S.E. end of Umol Island, in 17 fathoms. More sheltered anchorage, however, can be found in the channel between Umol and Ruk Islands, in 17 to 19 fathoms. The natives report numerous good passages through the reef extending to the West and North from Falau Islet.

The natives are larger than any we have seen at any other of the Pacific islands, and a very amiable and pleasant people to meet. They are very hostile to each other, and each island has its own clan. I think there would be no further danger, however, to any vessel visiting the lagoon. Mr. Kubary, a German naturalist, who resided here for a year, estimates the population at 10,000.

HALL ISLANDS.—In the relation of the voyages of Captain Saliz, in the French ship *Le Péruvien*, 1825-27, it is stated that this group was discovered by an English commander named Hall, in 1824, and that it consisted of two

groups, separated by a channel, which was named after his vessel, *Lady Blackwood Passage*. Capt. Lütke examined them in detail, and describes them in his narrative.

THE MOURILEU GROUP, which lies to the N.E., is composed of nine islands, the principal of which are *Mourileu*, *Rud*, and *Namourousse*. The reef which surrounds them is of an irregular form. On the leeward side it is for the most part submerged, and can only be distinguished by the greenness of the water. Should a vessel strike on this by night, there can be but very little hope for safety. On the West side of Ruá there is a passage, even for large ships, which renders it probable that anchorage would be found in the lagoon. The inhabitants only occupy the windward islands, and do not go to the S.W. angle of the group, except for the purpose of fishing. The easternmost islet, Mourileu, is in lat. $8^{\circ} 41' N.$, long. $152^{\circ} 25' E.$ The population amounted to about 100.

NAMOLIPIAFANE, or *Fananou* of Lütke, the S.E. group, is 40 miles in circumference, and encloses thirteen islands, the principal of which are *Ikop*, *Fananou*, and *Namouine*. These islands, as well as those which compose the Mourileu group, are very small, the largest not being more than two-thirds of a mile long. The rest of the space is occupied by the reef, which is not less dangerous here than that of Mourileu. The entrance to the lagoon is about the centre of the S.E. side. Capt. Lütke took off a sailor, William Floyd, who had been left here by a whale ship, and from whom he gathered some particulars of the archipelago. Namouine, the southernmost, is in lat. $8^{\circ} 25' 30'' N.$, long. $151^{\circ} 49' 15'' E.$ The inhabitants numbered about 50.

EAST FAIU, or *Lütke Island*.*—This little island possesses a name which was repeated in another to the westward; hence its prefix by Captain Lütke. Krusenstern proposes the name of *Lütke Island* on this account. It is but a small islet, not more than a mile long, and about three-quarters of a mile broad, surrounded by a reef. The Caroline islanders sometimes touch here in their passages to procure fresh water, which is deposited by the rain in a small basin on it. It is in lat. $8^{\circ} 33' 20'' N.$, long. $151^{\circ} 26' E.$ The population was about 50.

NAMONUITO ISLANDS.—The S.W. isle of this group was seen by Capt. Ibargoitia, in the *Philippine*, in 1801; he called it *Anonima*, because it did not appear on the charts. It was named by Morrell *Livingston Island*, in 1832. In Capt. Duperrey's chart it is called *Bunkey Island*, from the name of a commander who crossed the group (so it is stated) in 1824.

The Namonuito group, according to Capt. Lütke's observations, lies between lat. $8^{\circ} 33'$ and $9^{\circ} 0' N.$, long. $150^{\circ} 31'$ and $149^{\circ} 47' E.$ Whether as the commencement or the base of a group of islands, or else of a single island, which

* It may be observed that Admiral Krusenstern has applied the name of Lütke to the large group to the West, next described, in his atlas. This is probably an oversight.

some day will exist here, this place merits particular attention. It presents all the aspect of the coral formation from its origin. Either from its later formation, or its greater extent, it remains behindhand of the rest of the group, and now forms but the elements of a group. Here is the bed of the future coral dike, having a depth equal to 20 fathoms, and bestrewed with banks of little depth. At the windward limit of this dike there are already some islets united together by a reef, but it is not yet continuous; on the opposite side there is also an island. The reefs extend from the two extremities for a short distance along the dike, the space between it and the reefs being occupied by submerged banks, which are still separated by large intervals. It would be interesting to follow the progress of this incipient coral group, which may take thousands of years to completely form, and would then be one of the largest, being 45 miles from East to West.

The south-easternmost of the windward group is *Piserarr*, or *Pisserarre* (or *Pizaras* of M. Chamisso), and is in lat. $8^{\circ} 34' 20''$ N., long. $150^{\circ} 32' 30''$ E. Beyond this, on the N.E. face, are *Ounalik*, *Amytides*, *Pilipal*, and *Onooup*; and N.W. of these again are two other islets, *Maghyr* and *Maghyrarik*, at the North extremity of the group. These three groups are united to each other by a reef, on which the sea breaks in some parts; in others only marked by the greenish colour of the water.

The south-westernmost island, *Ulul* or *Onooun*, the Anonima of Ibargoitia, is in lat. $8^{\circ} 36'$ N., long. $149^{\circ} 47' 30''$ E. Between it and *Maghyr*, the reef consists of a series of submerged shoals. Captain Lütke did not land on these islands, but was visited by numerous canoes. The population is about 50.

Mannaijen or Gray Feather Bank, which was stated by Chamisso to have been found by Don Luis Torres in lat. $8^{\circ} 20'$ N., long. 149° , and had 21 fathoms water on it, was unsuccessfully sought for by Capt. Lütke in this position. He sailed on this parallel as far as long. 148° without finding bottom with 50 fathoms of line. The determination of the position of this bank is important, as it may be an island or reef in course of formation. It is said that the discoverer sailed for three entire days on it.

This bank, probably, was again seen by Captain McLaughlin, of the ship *Gray Feather*, who fell in with discoloured water in 1851, and sounded in $19\frac{1}{2}$ fathoms, coral bottom. From aloft the reef could be distinguished as of a circular form, $2\frac{1}{2}$ miles in circumference. Lat. $8^{\circ} 9'$ N., long. $148^{\circ} 44'$ E.—(*Ann. Hyd.*, VII., p. 18.) This is 11 miles South of the older announcement, but it is perhaps not too great a discrepancy.

McLaughlin Bank is another reported bank of 4 fathoms, in lat. $9^{\circ} 12'$ N., long. $148^{\circ} 6'$ E. The German war-vessel *Hertha* passed near the positions of McLaughlin Bank and Gray Feather Bank, but no indications of these dangers were seen.

TAMATAM, or *Los Martires Islands*, were seen by Duperrey. They were also visited, in 1876, by the German war-vessel *Hertha*, Captain Knorr, who

found that the group consists of four islands and not three as previously supposed. They are all small and low, with dangerous reefs jutting out from them in all directions, only the two southern islands, named *Tamatam*, being connected by a reef 6 miles in extent, East and West. The group extends over a space 11 miles long, North and South, by about 6 miles in breadth. The eastern *Tamatam* is in lat. $7^{\circ} 27' 30''$ N., long. $149^{\circ} 28'$ E. *Fanadik*, the middle island, is about 4 miles N.N.W. of the western *Tamatam*, and is not more than a quarter of a mile in diameter, but is surrounded by a reef. *Olap*, the northernmost, is $7\frac{1}{2}$ miles N.E. of *Fanadik*, and is in lat. $7^{\circ} 38'$ N., long. $149^{\circ} 30'$ E. It is the largest of the group, and, like the others, surrounded by dangerous reefs, extending 4 miles to the S.W. They are thinly populated, and appear to be very lightly wooded. The largest and most abundant are the cocoa-nut trees; but the inhabitants are badly supplied with fruits. There is but little inducement to visit these islands, the less so on account of the reefs and dangers, the strong currents which set between them, and also from the hostile and treacherous character of the natives. The population was about 200.*

POLOAT, or Enderby Islands.—The latter name was given to a group by Capt. Renneck, in 1826, in the service of the well-known noble merchants of London. In 1799, Capt. Ibargoitia discovered an island, which he called *Kata Island*; but Freycinet decided that it was in reality two islands, one of which is called *Pouloukot* (*Ploat* or *Pozoot*), and the other *Alet*, which is in lat. $7^{\circ} 19' 25''$ N., long. $149^{\circ} 15'$ E. They lie on a reef about 6 miles in extent, East and West. The population was about 100.

Enderby Bank, a coral reef, with 7 fathoms water, lies 6 or 7 miles W.N.W. of *Alet*. *Uranie Bank* lies the same distance E.N.E. of *Ploat*. Capt. Löser, of the German brig *Susanne*, states that he sailed for 12 miles on an E. by S. $\frac{1}{2}$ S. course over it, obtaining soundings varying from 7 to 31 fathoms; the position started from being at a distance of 7 miles E.N.E. of *Pozoot*, or in lat. $7^{\circ} 22'$, long. $149^{\circ} 25'$.

Tamesa or Susanne Reef.—In 1873, Capt. Jones, of the ship *Tamesa*, reported that he passed very near the western side of a reef, on which the sea was breaking heavily, in about lat. 7° N., long. $149^{\circ} 10'$ E. In 1876, Captain Löser also reported that a reef, having a few black rocks above water, was ob-

* **BLACKLOCK SHOAL.**—Captain Blacklock, of the ship *Cowiemulsie*, in 1861, reported a shoal at 20 miles E. by N. $\frac{1}{2}$ N. from the *Martires*, in lat. $7^{\circ} 36'$ N., long. $149^{\circ} 36'$ E. He saw the bottom quite distinctly, with casts of 7 fathoms on one side of the ship, and 15 fathoms on the other; some of the coral heads appeared to him close to the surface. He sailed for 3 miles on an East course, carrying soundings of from 7 to 15 fathoms, then suddenly 30, and no bottom at 100 fathoms. If the position of this shoal be correct, the *Martires* must have been considerably too far to the eastward on his chart, and it should be observed, that it would be impossible to see them at the distance reported by Captain Blacklock.

served in lat. $7^{\circ} 7' N.$, long. $149^{\circ} 13' E.$, or about $12\frac{1}{2}$ miles S. $\frac{1}{2}$ W. from Alet. The reef extended $1\frac{1}{2}$ mile, N.N.W. and S.S.E., and the breadth was estimated at half a mile.

SUK (Poulousouk, Sooughe), or *Ibargoitia Island*, was seen by Captain Ibargoitia in 1799 and 1801. It was named *Poulousouk* (Pulo Suk) by Capt. Freycinet, and was taken by Ibargoitia, though with no probability, for the *San Bartolomé* of Quiros, in 1597. Its position is about lat. $6^{\circ} 40'$, long. $149^{\circ} 23' E.$ It is of coral formation, covered with cocoa-nut trees, and similar in size and appearance to Poulouhot. It is inhabited by a light-complexioned race, about 100 in number. It is called *Sooughe* on Lütke's chart. At 15 miles to the East of it is a bank, seen by the vessel *La Paz*, in 1819.

Capt. Cheyne says:—I was told by the master of a whaler some years ago, that a coral bank, with irregular soundings of from 10 to 30 fathoms, extends from this island to the N.W., for a considerable distance, and terminates in a dangerous reef. The only idea he could give of the distance was, that when abreast of the reef, the trees on Pulo-souk were just visible from the topsail-yard. This danger requires confirmation; but ships passing should be on their guard, and keep a good look-out.

Lady Elgin or Irons Shoal.—A coral shoal was sailed over by Captain D. Irons, of the *Lady Elgin*. The spot struck in 10 fathoms was in lat. $6^{\circ} 18' N.$, long. $149^{\circ} 28' 30'' E.$, from which a depth of $7\frac{1}{2}$ fathoms was carried for about $1\frac{1}{2}$ mile to S.S.W., and then to N.N.W., when broken water was seen to North, and clear water to West—(*Naut. Mag.*, 1855, p. 278.) It may be the same as *La Paz Bank* of 1819, which is placed at 25 miles to the northward.

Helene Reef.—In 1874, Capt. Levenson, of the German barque *Helene*, reported the existence of a reef in about lat. $5^{\circ} 30' N.$, long. $149^{\circ} 10' E.$ The reef, on which the sea was breaking, appeared to be about 8 miles long, E. by S. and W. by N., and about a quarter of a mile broad. Captain Siveright, of the barque *Wandering Minstrel*, also stated that he found a coral bank, of 7 to 9 fathoms, in lat. $5^{\circ} 32' N.$, long. $149^{\circ} 13' E.$

A bank of 13 fathoms has also been reported in lat. $4^{\circ} 13' N.$, long. $150^{\circ} 15' E.$

PIKELOT, or *Coquille Islet*.—This small islet was seen July 3, 1824, by Capt. Duperrey. It was named after Duperrey's vessel by Krusenstern; the discoverer named it *Bigali*; Lütke writes it *Pigali* or *Pyghella*, and places it in lat. $8^{\circ} 9' N.$, long. $147^{\circ} 42' E.$ Don Luis Torres, who saw it and the adjacent island, names them *Pigouelao* and *Faliao*. It is not more than 300 yards in diameter, and nearly level with the water's edge, and surrounded by a reef, half a mile long, North and South. It is covered with a thick undergrowth of bushes, and about fifty cocoa-nut trees. It is uninhabited.

WEST FAIU ISLET, in lat. $8^{\circ} 3' N.$, long. $146^{\circ} 50' E.$, that is, $52\frac{1}{2}$ miles W. by S. of Pikelet, is a similar islet to it, both in size and character; but the reef extends over 2 miles eastward and westward of it, forming a lagoon on its southern side. There is a high wood on the island, among which bread-fruit

trees were seen, but not a single cocoa-nut tree. It is also uninhabited. There is another island of the same name to the eastward, before alluded to, which has been named Lütke Island for distinction.

Oraitilipou Bank, seen by Don Luis Torres, lies somewhere between these two islets. It had but 11 fathoms over it, but was not found by Lütke, after a careful search. It is placed on the chart in lat. $8^{\circ} 7' N.$, long. $147^{\circ} 15' E.$

Pikela or *Lydia Island* is marked on Capt. Duperrey's chart in lat. $8^{\circ} 38'$, long. $147^{\circ} 10'$ ($147^{\circ} 13'$). Its existence may be considered as doubtful, but it is mentioned in Dr. Gulick's list.

SATAWAL (Setuahal), or *Tucker Island*, was seen by Capt. Wilson, in the missionary ship *Duff*, October 25, 1793. Duperrey places it in lat. $7^{\circ} 22' N.$, long. $147^{\circ} 6' E.$ The island is not more than 2 or 3 miles in circumference, and the articles of subsistence it produces are supposed to be only fish, roots, cocoa-nuts, and, perhaps, bread-fruit. When the *Duff* approached, some canoes of natives (not a stout race) came off, and two men, Tucker and Connelly, deserted here. Capt. Cheyne (1846) says that it may be approached within one-quarter of a mile, as no hidden danger exists; that it is of coral formation, covered with cocoa-nut trees. It had about 200 inhabitants.

Swede Islands consist of three separate groups, that to the East being named *Lamotrek* (Namurrek, or Namouttek); the middle group, *Elato*; and the N.W. group, *Olimarao*, or Namoliaour. They are most likely the islands named *Swede* and *Haweis Islands* by Captain Wilson, of the *Duff*, 1793, the first on account of a Swedish sailor of his, who was landed at his own request on one of them. They were examined by Lütke.

LAMOTREK (of Dr. Gulick), an atoll of triangular form, is 7 miles in extent, E.S.E. and W.N.W. Several islets stand on the reef, which encloses the lagoon, the S.E. of which is in lat. $7^{\circ} 27' N.$, long. $146^{\circ} 30' E.$ The population was about 200.

ELATO, or *Haweis*, is nearly on the same parallel as Lamotrek, in $7^{\circ} 30' N.$, long. $146^{\circ} 19' E.$ This group consists of an uncovered reef, $4\frac{1}{2}$ miles in length, N.N.E. and S.S.W., and 8 cables in its greatest breadth, with some islets, the southern of which is called *Falipi*. On the chart of Cantova, nearly in this spot, it is marked *Bank of Falipi*. Can this bank have become an island in the interval of 100 years? There is a port in the Elato group, and the vessels sent from the Marianas to collect biche-de-mar always stop here. Capt. Lütke could not find the entrance to the lagoon, which he was afterwards told was on the eastern side, contrary to the usual law of coral reefs. The natives were very shy, and would not visit his ship. The population is about 300.

TOASS.—At a little over a mile S.S.E. from Falipi is the northern end of a smaller reef, on the South end of which are the islands named Namoliaoure and Toass, the latter in lat. $7^{\circ} 24' 30'' N.$, long. $146^{\circ} 19' E.$ This reef is about $1\frac{1}{2}$ mile long, N.W. and S.E., and encloses a lagoon.

OLIMARAO ISLES are two small islets, lying on the N.E. and S.W. ex-

tremities of a reef, discovered by Captain Lütke in 1828, Olimarao, the N.E. islet, being in lat. $7^{\circ} 43' 30''$ N., long. $145^{\circ} 56' 45''$ E. The group is not more than 5 or 6 miles in circuit, and had some timid inhabitants, who asked for food. The natives are about 200 in number.

Ianthe or Nile Shoal.—Two shoals have been announced as existing at 105 and 125 miles respectively distant from Ifalik or Wilson Island, in a southeasterly direction. The first by the ship *Ianthe*, in 1845, as in lat. $5^{\circ} 53'$ N., long. $145^{\circ} 39'$ E. (*Naut. Mag.*, 1846, page 265, and 1861, page 166); and the second by the barque *Nile*, in 1860, as in lat. $5^{\circ} 31'$, long. $145^{\circ} 42'$, nearly on the same meridian, but 22 miles apart.

The *Ianthe* passed within one or two ships' lengths of the eastern edge and the shoalest part of a ridge of sharp rocks (apparently not more than 8 or 10 feet under water, the water of a milky whiteness) in soundings of probably 6 or 8 fathoms. The shoal appeared to extend S. by E. and N. by W., about half a mile. The *Ianthe* claims to have obtained, on the same day, a good meridian altitude, and estimated the nearest land to have been distant 85 miles. The *Nile* passed over a reef, with little room to spare, the rocks being plainly seen on each side of the vessel, and the man aloft reported breakers on one side; the barque was before the wind, and only a few minutes between the rocks. Notwithstanding the great difference in the latitude, the two reports refer probably to one and the same reef.

Should they be but one reef, the mean latitude would be $5^{\circ} 42'$ N., otherwise there may be a continuous reef, or series of reefs, between the above parallels.

IFALIK or Wilson Islands.—This is a small group, seen as *two isles* by Wilson, in the *Duff*, in 1793. They were visited by Lütke, April 3, 1828, and were found to consist not of two, but of *four* islets; *Ifalik* (or Evalouk), *Moai*, *Ella*, and *Fararik*, lying, as usual, on the edges of a lagoon about 5 miles in circumference. This group is more populous in proportion than the others. The *Séniavine* was soon surrounded by twenty-five canoes, containing at least a hundred natives, who were distinguished from all the rest of the Caroliners by their clamorous disposition; he had some little trouble from their stealing propensities. Capt. Cheyne says there is a good boat passage through the reef, on the South side of the group. The islets are covered with coconut and bread-fruit trees. The S.E. point of the group is in lat. $7^{\circ} 14'$ N., long. $144^{\circ} 31'$ E. The population was about 200.

At 11 miles N.E. by N. of this group is a bank of 12 fathoms, with probably less water.

WOLEA or Ulie Islands.—Captain Wilson, in the *Duff*, 1793, discovered a group, which he named the *Thirteen Islands*; but when the minute examination was made by Lieut. Zavalichine, Capt. Lütke's officer, it was found to consist of twenty-two islands, the names of which are very well designated on Captain Freycinet's chart, and by M. Chamisso. The name, as given on the

North Pacific.

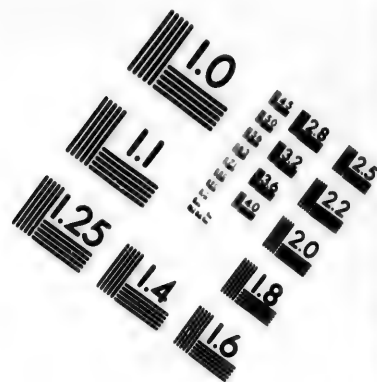
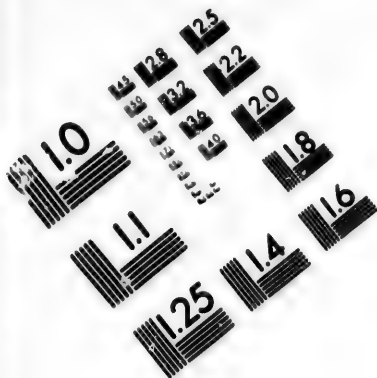
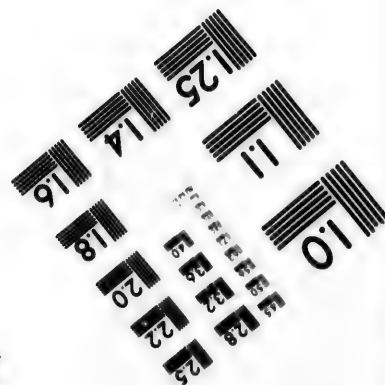
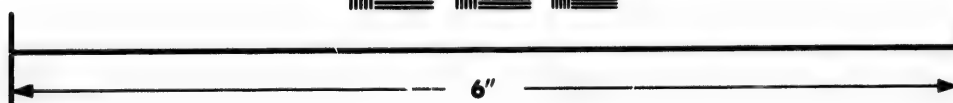
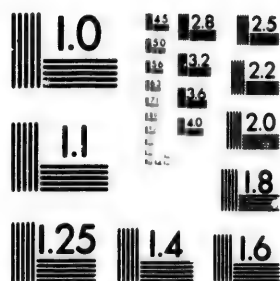


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chart on a large scale then drawn up, is *Oulleay*, in the narrative *Ouleai*, by Dr. Gulick, as above.

From the observations made in the *Séniavine*, the northern point of *Raour*, the easternmost of the group, lies in lat. $7^{\circ} 21' 39''$ N., long. $143^{\circ} 57' 30''$ E.

The charts of this group are a very good example of what exaggeration will do to mislead the navigator. In the old charts this group occupies a space of two or three degrees in longitude. Capt. Freycinet reduced it to seventy miles; but when the survey was made by Capt. Lütke, it was found not to exceed six nautic miles in extent.

The fatiguing uniformity of the coral islands has at least this advantage, that one description serves for all. But the *Wolea* group differs from the others in this respect. Its figure is very irregular; it has two projecting angles to the North, and a deep indentation between them. According to the usual hypothesis of formation, this figure cannot be explained but by supposing that two independent groups were formed at the same time in this part. The channel of 12 yards, between the islands of *Angaliyarail* and *Farailles*, seems to mark their separation. The reef, which extends thence to the S.E., reunites abreast of *Motogoseu* to the reef running from *Raour* Island, thus completing the eastern group; at the same time a depth of $4\frac{1}{2}$ fathoms, and the reef extending East and N.E. from *Felalis*, marks the direction of the prolonged reef, which would in time reach to *Farailles*, and form the western group.

Wolea or *Ouleai*, properly so called, is advantageously distinguished not only from the rest of the group, but from the generality of coral islands. Its southern side has not the shoal which renders landing so difficult elsewhere; but the shore rises with a tolerably steep ascent, presenting an even, clean, sandy bottom, on which every grain of sand may be seen through the transparent water at the depth of several fathoms. The interior of the island is pleasant; it is a wood intersected in all directions by footpaths, and dotted with cleared spots, where you meet with isolated houses. Unlike the generality of coral islands, when you advance only a few steps from one shore, and then reach the opposite, it occupies a large space, on which fine bread-fruit trees have sufficient room to form a sort of park. It occupies the N.E. angle of the group, and is of an irregular triangular form, three-quarters of a mile in diameter. Its North extreme is in lat. $7^{\circ} 23' 30''$ N., long. $143^{\circ} 57'$ E.

Palliou Island extends from its S.E. extremity in a nearly true South direction, and is nearly connected with *Raour* Island, the south-easternmost of the group, the two together being $1\frac{1}{2}$ mile in length.

On the western side of *Raour*, off the North part of which the *Séniavine* is anchored, are four or five artificial harbours, such as had not been seen in any other part of the Carolines. A jetty of large stones ran out for 100 yards into the sea, and at each side of its extremity another line of stones, projecting at an angle of about 60° , so that the whole has something the form of an anchor. From the South end of *Raour* the reef projects nearly half a mile; and between

it and *Tagoilap Island*, 2 miles to the W.N.W., is *Motogozou Islet*, which is very small, and, like all the rest, surrounded by a reef, so that the anchorage in the eastern group has two entrances, one on each side of *Motogozou*.

Felaliase or *Falalis Island*, the S.W. of the group, lies 2 miles to the S.W. of *Tagoilap*. Between it and *Motogozou* there are some detached coral patches. The reef runs to the N.W. three-quarters of a mile from *Felaliase*, leaving a navigable opening into the lagoon between it and *Fatulap* or *Fatullap*, a small islet, one of a group which extends N.N.W. and North, $1\frac{1}{2}$ mile, to *Oulemeray*, the N.W. island of the group. Thence the chain is continued through *Seliaps* and some smaller islands to E.S.E., to *Farailiese*, between which and *Langgaligaraile* is the very narrow but navigable channel before alluded to, forming a northern entrance to the lagoon.

Captain Cheyne says—This group is well inhabited by a light copper-complexioned race, who, although friendly in appearance, should not be trusted. Their weapons consist of Spanish knives, spears, clubs, slings, and stones. Their canoes are similar in shape to the proa of the Mariana Islands. They perform voyages to Guam, and the other Caroline Islands in them. Their food consists of cocoa-nuts, bread-fruit, taro, bananas, sugar-cane, and fish. Ships holding intercourse with these natives should not allow any of them on deck. Dr. Gulick says the population was about 600.

EAURIPIK, or *Eourypygy*, is a small group, composed of only two islets, lying on a reef $2\frac{1}{2}$ miles long, N.W. and S.E. Lütke, who passed along its northern side, had no communication with the inhabitants whom he saw standing on the beach, consequently could gather no particulars of it. It has a lagoon. Their existence was then established, though on Arrowsmith's chart two islands are placed nearly in the same position, stated to have been seen by Capt. Hunter, in 1791; there is no notice of this given in his narrative. Their position is lat. $6^{\circ} 40' N.$, long. $143^{\circ} 10' E.$ Capt. Cheyne, who visited them in September, 1844, calls them the *Kama Islands*. The population amounted to about 150; now it is only about 50. The islets produce nothing but cocoa-nuts.

Earl Dalhousie Sheal, in lat. $8^{\circ} 4' N.$, long. $145^{\circ} 5' E.$, about 60 miles N.E. by N. $\frac{1}{4}$ N. from Ifalik, has a depth of 19 fathoms on it, coral bottom.

FORAULEP (*Farroilap* or *Fattoilap*) was in reality first discovered by Lütke, March 28, 1828. Such an island is stated to have been seen by Don L. Torres, but it had been placed at hazard on all charts previous to its position being fixed as lat. $8^{\circ} 36' N.$, long. $144^{\circ} 36' E.$ * It is a small group, not more than 4 miles in circuit, and composed of three islets, with a lagoon on their

* It is rather singular that Capt. Wilkes should state this island to be in lat. $10^{\circ} 46' N.$, long. $146^{\circ} 27' E.$, from the charts. The *Flying Fish* consequently passed over this position without seeing any indication of land: the same with *Fois Island*.—*Narrative of the United States' Exploring Expedition*, vol. v., p. 271.

West side. The group cannot afford much for resources. Its population was about sixty able men in 1828. It is now uninhabited, according to Dr. Gulick, who calls it *Gardner Island*.

GRIMES ISLAND.—From a report in the China Mail, Captain Grimes, of the ship *Jean*, discovered, in 1841, a high and well-wooded island, of 6 miles in circumference, in lat. $9^{\circ} 16' N.$, long. $145^{\circ} 43' E.$ It was again seen, in 1855, by Capt. Vice, of the French ship *Chili*, in lat. $9^{\circ} 17'$, long. $145^{\circ} 11'$; the descriptions entirely agree, and differ quite from Farroilep. It has since been announced as *High Island*, in lat. $9^{\circ} 11'$, long. $145^{\circ} 45'$, so that the latter position is probably nearly correct; the mean of the three positions is lat. $9^{\circ} 15'$, long. $145^{\circ} 33'$. It is not included in Dr. Gulick's list.

SOROL or *Philip Islands* are two small groups of islands, both seen by Capt. Hunter, in 1791. The easternmost is the largest, lying 5 miles from the westernmost, and in lat. $8^{\circ} 6' N.$, long. $140^{\circ} 3' E.$ There were about 20 inhabitants.

FAIS or *Tromelin Island*.—In 1828, Captain Legouarant de Tromelin discovered a very small low island in lat. $9^{\circ} 52' N.$, long. $140^{\circ} 42' E.$, to which Admiral Krusenstern gave his name. It is said that it is 5 miles long and 2 miles broad. Capt. Lütke examined it in 1828, and places it in lat. $9^{\circ} 46' N.$, long. $140^{\circ} 35' E.$, calling it *Feis* or *Feyis*. The size he mentions is also very different from Capt. Tromelin. He says:—This island is remarkable, because it is the only one of the Carolines that has no lagoon; it is formed of madreporic rocks, 30 ft. high, against which the sea beats immediately, and is *four versets* ($2\frac{1}{2}$ miles) in circumference. There is no anchorage in any part. On the South side, where the coast is sandy, there is less surf. Landing was very difficult here, and the natives were not so good sailors as in any other island of the archipelago. Bread-fruit trees were rare, but bananas were in tolerable abundance. The population was about 300.

ULITHI or *Mackenzie Islands*.—This group was discovered by the Spanish navigator Egoi, and was seen, in 1823, by Captain Mackenzie, who gave some notice of it in the Asiatic Journal for June, 1824. It was partially examined by Capt. Lütke, who states that the native name is Ouluthy.

It was on the northern one of the group, Mogmog, that the Spanish Jesuit, Padre Cantova, was killed on his second visit to the Carolines. This was during the endeavours to establish Catholic missions throughout the archipelago. When Capt. Lütke passed Falalep, on which the mission was planted, he was unable to land; which is to be regretted, as it would have been interesting to learn the result of the missionaries' devotedness after the lapse of a century.

The Islands Mogmog, Falalep, and others, on which was the Spanish mission, are at the N.E. part of the group. The whole is of great extent, and consists of low coral islands, covered with cocoa-nut trees, and connected by coral reefs, forming a large lagoon inside, with many good passages through the reef leading into it. This group is thickly populated by a light-complexioned race,

whose manners and customs are similar to those of the other Caroline islanders. These natives, although apparently mild and friendly to a stranger, are by no means to be trusted, as one or two Manila vessels were cut off at this group many years ago.

The two small islands on the eastern group, *Eap* and *Khilap* or *Hielap*, are connected by a reef to each other and to some others beyond them. These isles are inhabited, and from them a shoal extends for 15 miles to the S.E. The bottom was distinctly visible on its outer edge from the *Seniavine*, but some natives who approached said there was no danger in approaching these islands, though their notions of such danger might be very different from ours.

The western group, which is about 21 miles in extent, North and South, is formed of a great number of small islands (the chief of which are *Mogmog* or *Moguemogue*, *Troilem*, *Falalep*, &c.), united together by coral reefs. The two groups are separated by a channel 8 miles broad, into which Captain Lütke entered as far as the middle. The U.S. schooner *Flying Fish* entered the lagoon with not less than 7 fathoms on the bar, and procured some fish and cocoanuts from the natives, who were about 200 in number.

The S.W. point of the eastern group, which may be taken as the centre of all the islands, is in lat. $9^{\circ} 56' N.$, long. $139^{\circ} 50' E.$; and the island *Mogmog*, the northernmost of the western group, is in lat. $10^{\circ} 6' N.$, long. $139^{\circ} 45' 30''$.

Samos Reef.—In 1875, the captain of the American barque *Samos* announced a dangerous reef in lat. $10^{\circ} 37' N.$, long. $139^{\circ} 30' E.$ —*Annales Hydrographiques*, 1875, p. 273.

EAP or Yap (*Uap* or *Guap*) has been seen by many navigators, both in early times and more recently. The Padre Centova gives it a circumference of 40 leagues, but it is not nearly so extensive. It is frequently made by ships taking the eastern passage to China, and is also called *Unawb* by Capt. Horburgh. It was visited by the German war-vessel *Hertha*, in 1876, and by H.M.S. *Espele*, in 1883.

At a distance it assumes the appearance of two or three islands, and when nearer it seems like a group of islands contiguous to each other, the whole encompassed by a chain of black rocks. This deception probably caused Capt. John Hunter, who passed it in 1791, to place three islands in this situation.

It differs from other islands of the Caroline group, being larger, with a different soil, and probably of volcanic origin; its northern part is deeply indented. It is surrounded by a coral reef, about 25 miles in extent, N.E. by N. and S.W. by S., with an average breadth of about 5 miles; a narrow spit extends about 5 miles S.W. by W. from the S.W. point of the island, some of the black rocks appearing just above water near its extremity. The southern part of the island is low, and covered with underwood, above which rise numerous cocoanut trees; the northern half is traversed by a ridge of hills, its highest point attaining an altitude of 1,170 ft.

The island has a pleasing aspect from the sea, being interspersed with many

houses. It is not covered with wood, but many parts appear luxuriant, and abound in cocoa-nut trees. At the time of the *Hertha's* visit, it was under the rule of five chiefs, to whom tribute was paid by the western Caroline Islands, as far eastward as the Wolea group. There were also a few white settlers, acting as agents for German traders, towards whom the conduct of the natives was reported to be peaceable.

The northern islet is in lat. $9^{\circ} 37' N.$, long. $138^{\circ} 8' E.$; the South point is in lat. $9^{\circ} 20'$, long. $138^{\circ} 1'$.

Tomil Bay.—Capt. Cheyne says:—It is possessed of an excellent harbour on the S.E. side, formed in an angle of the coast, by reefs. The entrance, which is through the reef, is about 200 yards wide, and can easily be made out from the mast-head when standing along the reef. When inside the channel widens, and trends more to the northward. The anchorage at the head of the harbour, off the village of Tomil, is perfectly safe, the holding ground good, and the depth of water moderate. Entrance Rock, on the West side of the entrance, is in lat. $9^{\circ} 25' 5'' N.$, long. $138^{\circ} 11' 45'' E.$, according to Capt. Blohm, 1871, but later observations place it 5' farther to the eastward.

The South part of the island is low, but it rises into hills towards the centre, which is moderately elevated. It is visible 24 to 27 miles, and makes in three hummocks, which would lead a stranger passing to mistake it for three islands. There is very little wood inland. The shore in many places is lined with mangroves, and the low lands between the villages are covered with small wood. The cocoa-nut tree is very abundant, particularly on the southern part. The villages are situated near the shore amongst groves of cocoa-nut, bread-fruit, and betel-nut trees. In consequence of the scarcity of large timber, the natives get their proas built at the Pallou Islands, which they frequently visit.

The natives are an able-bodied race, well formed, and of a light copper complexion. They are more advanced in civilization than any of the other Caroline islanders; their villages being regularly laid out in streets, which are neatly paved. They have also well-constructed stone wharves and piers. Each village has a large paved square, where the chiefs assemble for consultation. Captain Cheyne remained here seven weeks in 1843, collecting biche-de-mor.

The natives are of a treacherous disposition, and have out off several Manila vessels which had gone there to collect biche-de-mar. The chiefs confessed to Capt. Cheyne, of the *Naiad*, that they had taken two Spanish vessels; the last one having a crew of fifty Manila men, who were all massacred. The tribe at the harbour had also formed a conspiracy to cut them off. However, they now appear to be more trustworthy, but caution is advisable. Dr. Gulick says that the population was about 2,000; later estimates make it about 8,000.

Sailing vessels should not enter Tomil Harbour without a pilot; the services of Captains Halcomb or O'Keefe can be obtained by heaving-to outside. The pier off Tomil is a good landmark. A rock having only 12 ft. water on it, was reported to lie off the entrance, about 5 cables E. $\frac{1}{2}$ S. from Entrance Rock.

It is high water, on full and change, at 7^h 15^m; springs rise 4½ ft.—*Captain Bridge and Lieut. Ommanney, H.M.S. Espiègle, 1883.*

Capt. Holcomb, an American, resident several years at Yap, and a navigator in the neighbouring seas, states that typhoons and cyclonic storms are unknown in Yap. The N.E. trade blows with tolerable freshness and steadiness from the beginning of October to the end of May. The S.W. monsoon prevails during June, July, and August, but is frequently broken by short spells of easterly winds. Rain falls occasionally all the year round, but the rainy season is between the beginning of June and the beginning of September. The climate was described as being remarkably pleasant. Though hurricanes are unknown, strong S.W. gales generally blow towards the close of the S.W. monsoon season, late in August or September. This is also the season of very light winds, when sailing vessels get about amongst the islands with difficulty.

Hunter Reef is a narrow coral reef, over which Capt. John Hunter passed in the *Waakramheydt*, July 17th, 1791. He had 16 fathoms water when on it, and saw the bottom very distinctly. It extends nearly North and South, and is about 23 miles N.N.E. of Yap. Lat. 9° 57½' N., long. 138° 22' E. It was reported to lie 9 miles farther to the westward.

NGOLI, or *Matelotas Islands*.—The first notice of these islands was given by Villalobos, who discovered them in 1545, but it would appear that they had been previously visited, for the inhabitants approached holding up a cross, and calling *Buenas dias Matelotas*, from which their name was given. On Capt. Lütke's chart they are called the *Western Lamoliaour Group*; Dr. Gulick says *Lumoliork Islands*; and they have been called *Goulou Islands*. They were seen, in 1796, by Admiral Rainier, in the *Suffolk*, who gave them the name of *Spencer Keys*.

The Ngoli or Matelotas group is composed of three (or five) small, low, and wooded islands, connected by reefs and sand-banks. The two northern ones bear from each other N.E. ½ E. and S.W. ½ W., and it is dangerous to approach them in the night, as a coral reef projects 2 leagues to the northward of the N.E. island, having in some places high breakers. The northern islet, however, is stated to be 150 ft. high. On January 3rd, 1798, Captain Moring, in the ship *Duckingsfeld Hall*, had great difficulty in weathering the group. He says:—"How far the reefs may extend to the westward I cannot pretend to say, but they stretched farther than we could see on a clear day. The distance from the northernmost to the southernmost island is about 6 leagues." In 1843 the South island was inhabited, but the population did not amount to more than thirty-five souls, who lived entirely on cocoa-nuts and fish. The population of the group is about 100.

Capt. Cheyne thus describes them:—The South islet, which has cocoa-nut trees, and a few inhabitants on it, is in lat. 8° 17' N., long. 137° 33' E. From this to the N.E. islet, which is in lat. 8° 35', long. 137° 40', the reef on the eastern side is at some distance from the South islet, in detached patches, on

which the sea does not break with a westerly wind. The reef extends 6 miles in a northerly direction from the N.E. islet; and its North extreme is in lat. $8^{\circ} 41' N$. The western islet lies in a S.W. by W. direction from the N.E. one, and is also surrounded by dangerous reefs. Their extent to the West and N.W. has not been ascertained, but they probably connect the islets. There is a passage on the N.W. side of the South islet leading to the lagoon, but the anchorage inside, if any, would be very unsafe. This is a most dangerous group, and should have a good berth in passing, particularly in hazy weather, or dark nights, as the islets cannot be seen above 10 or 11 miles in clear daylight, and strong currents often prevail in their vicinity. The southern islet is safe to approach on the South side, as no hidden dangers exist.*

PALAU OR PELEW ISLANDS.

There is no doubt but that these islands are the same as the Arrecifos of Villalobos, in 1545. According to the Spanish missionaries, Padres Clara and Cantova, the native name is *Paulogus*; other authorities call them *Palao*s, *Pally*, or *Pallou*. In the charts made by Capt. Macluer they are called *Pellew*. But the name by which they were generally known is *Pelew*, which, though not exactly correct, has for this reason been retained.

We acquired a more particular knowledge of these isles and their inhabitants from the wreck of the *Antelope* packet, Capt. Wilson, which was lost upon the coast in 1783. "The captain," says an intelligent writer, "found the natives delicate in their sentiments, friendly in their disposition, and, in short, a people that do honour to the human race. The astonishment which those who first discovered the English manifested on seeing their colour, plainly showed that they had never before seen a white man. The country is well covered with timber trees, the trunks of which furnish the natives with canoes, some large enough to carry thirty men. Yams and cocoa-nuts, being their chief articles of subsistence, are attended to with the utmost care. They have also the bread-fruit tree, oranges, lemons, and other fruits. The men go entirely naked; the women nearly so. The conduct of these people towards the

* *Warwick Island*, a whaler's report, in lat. $4^{\circ} 24' N$, long. $136^{\circ} 26' E$, requires confirmation. It may refer to Pulo Marière, nearly 4° to the westward.

In 1877, Captain Barnaby, of the U.S. barque *Quickstep*, reported that he saw what appeared to be a shoal, the sea breaking over it in white foam, extending E.N.E. and W.S.W. for about $1\frac{1}{2}$ mile, and apparently about an eighth of a mile wide. The position assigned to these breakers was lat. $4^{\circ} 18' N$, long. $136^{\circ} 21' E$, which is very close to that of Warwick Island. This position was passed over by H.M.S. *Esperanza*, 1883, but no signs of shoal water were seen in the vicinity, and no bottom could be obtained with 50 fathoms of line.

English was uniformly courteous and attentive, accompanied with a politeness which surprised those who were the objects of it."

Capt. Cheyne says:—The Pallou natives are quite a distinct race from the Caroline islanders. They are of a much darker complexion, less robust generally, and of smaller stature, but a great deal more intelligent, and polished in their manners.

Capt. Robertson, in his memoir of 1795, has very justly censured the officers of the *Antelope* for not having given, in any part of their narrative, the smallest information, or "said one single word, whether it was possible for a ship to anchor amongst, or near, any of these islands;" and he observes that the only piece of nautical information he could find was the general description of their limits, which he has shown to be grossly erroneous. Capt. Robertson says that the group "is a distinct range or chain of islands, extending 28 leagues in length, N.N.E. and S.S.W., but in breadth very narrow; they are of moderate height, small in size, and in number almost innumerable. In the *Vansittart*, 1781, I had an opportunity of exactly determining their southern extremity and eastern direction; we fell in with that side, and stood on to the N.N.W., thinking to weather them. After getting sight of the northern islands, the wind changed more northerly, which even prevented us from being able to weather the island we at first took to be the northernmost, but which we found was not so; therefore, judging it impracticable to get to windward, without a great loss of time, we wore and stood to the southward, coasting along the islands, at the distance of about 4 or 5 leagues from the East side; rounded the southernmost, at the distance of 3 leagues; from which we took a departure, allowing the latitude, by a good meridian altitude, to be 6° 56' N.; the northernmost island I make to lie in lat. 8° 9' N. As to their longitude, I am not quite so certain; there is such a discordancy in all the accounts, that it is impossible for me to determine exactly. I had expected much satisfactory and authentic nautical information respecting these islands from Wilson's account of them, published by Mr. Keate; but in that I was sadly disappointed, there being not one useful remark, throughout the whole book, that could possibly be of the smallest utility to a seaman."

A sketch of the southern range of these islands, by Lieut. John Macleuer, was published by Mr. Dalrymple, in 1791, and in 1876 a partial survey of the group was made by Capt. Knorr, of the German war-vessel *Hertha*, from which authorities some of the following description is derived.*

The circumstance by which this group and its history are made most familiar to English readers, is the account of *Prince Lee Boo*, who was brought over from thence by Capt. Wilson, after the wreck of the *Antelope*, August 9, 1783. He was the second son of Abba Thulle, the king, and on his arrival in England

* *Annalen der Hydrographie*, 1876, Heft vii.

evinced such an aptitude for all civilized relations, with such an excellent disposition, that his death, from smallpox, which occurred December 27, 1784, when he was twenty years old, was felt throughout England with lively sensation. He was buried in Rotherhithe churchyard, near its N.W. angle, he having died in that parish. The East India Company erected the vault over his remains.*

In the Supplement to the Voyage of the *Antelope* an account is given of the visit of the ships *Panther* and *Endeavour*, which were sent out there with the intelligence of Prince Lee Boo's death. In this portion, too, is the account of Lieut. Macluer's residence in the group. The whole of these narratives place the natives in a most amiable light. But there is a dark side to the picture; whether from the innate evil of the uncultivated savage, or, what is more probable, from the aggressions of foreign ships touching there, their fame has been sullied by treachery. The *Syren*, whaler, Capt. Coffin, was nearly cut off here, March 21, 1823, on passing the southernmost island. They came on board, 100 in number, apparently friendly; but watching an opportunity, they attacked the crew, and were only repulsed after desperate fighting, during which most of the crew, thirty-seven in number, were wounded, and two officers killed. In 1880, a British schooner was stated to have been pillaged by the natives.

Captain Ibargoitia remained under easy sail for five days, in 1801, off the islands, and gives as good an account of the natives, with whom he had continual communication, as does Capt. Wilson; they most disinterestedly brought off to him fish, cocoa-nuts, bananas, and various roots. He says that Coror Island is the only one where you can anchor; but he was prevented doing so by winds and currents.

Winds.—The N.E. monsoon blows here from September or October to April or May, usually between N.E. and East; S.E. winds, however, are not uncommon in the vicinity of the islands.

Revolving Storms, supposed to be the tail ends of typhoons, are said by white residents to occur in the Pelew group at intervals of from 10 to 12 years. They have been experienced as early as August, and may be encountered up to November.—H.M.S. *Espitgle*, 1883.

The group, which consists of six greater and a number of smaller islands, extends for a distance of 85 miles, about N. by E. and S. by W.; its greatest breadth is not more than 7 miles; but taking into account the surrounding reefs, this breadth would be trebled. There are several passages through this reef, as shown on the chart. Taro and a few pigs and goats may be purchased from the natives. The latter are about 3,000 in number.

* An Account of the Pelew Islands, from the Journals of Captain Henry Wilson, by George Keute, 4to., 1788; also a Supplement to the foregoing, by J. P. Hockin, M.A., 4to., 1803.

It appears, like Yap Island, to be of volcanic origin, and consists of six large islands, which, reckoning from the southward, are called Angaur, Pillu, Eil Malk (formerly called Earakong or Irakong), Urukthapel, Korror, and Babelthuap, with numerous islets of smaller size, these latter sometimes rising perpendicularly to a height of 600 ft. Babelthuap is by far the largest island, containing an area equal to all the rest put together. The only island not surrounded with coral reef is Angaur, which is detached, and the southernmost of the group.

When the German war-vessel *Hertha* was here in 1876, the native population was divided into twelve tribes, the greater number residing in Babelthuap, headed by a chief called Rupak. Of the existing kings, the Erani of Korror, and the Erani of Artingal seemed most powerful, but they were in constant feud with each other, and failed to recognise the supreme power of the Spanish Government. The principal occupation of the men, when not at war, is fishing; the women cultivating the soil. The only export was trepang, in exchange for old guns, ammunition, hardware, blankets, and spirits. Tortoise-shell of late years has become scarce.

Kajangle Isles.—The northern limits of the group consist of four or five small islands, the largest of which is called *Kyangle* or *Kajangle*, about $1\frac{1}{2}$ mile long, and very narrow, its centre in lat. $8^{\circ} 2' 30''$ N., long. $134^{\circ} 38' 30''$ E. It was called *Moore Isle* by Capt. Douglas, in 1788. Three others, off its South end, are called *Arayonzet*, *Carapellas*, and *Korack*. These islands are surrounded by a reef, whose diameter is $4\frac{1}{2}$ miles North and South, and nearly 5 miles East and West. Capt. Douglas, of the *Iphigenia*, states that he saw two other low or sandy isles at 8 miles West of Moore Island, which he calls *Good Look-out Islands*, portions of the reef which dry in Macluer's chart.

Ngaruangl Reef, 11 miles to the N.W. $\frac{1}{4}$ W. of Kajangle, is of a most dangerous character. It was formerly supposed to be very extensive, having been reported to extend as far as lat. $8^{\circ} 45'$, and thence to the West farther than the eye could reach. It is now stated to be of a triangular shape, about 6 miles in circumference.

Kossol Reef, the North point of which is about 2 miles South of the South point of Kajangle Reef, is about 7 miles long, N.N.E. and S.S.W., and $2\frac{1}{2}$ miles in greatest width, the passages North and South of it having depths of 10 to 20 fathoms, sand and coral bottom. At 4 miles westward of its South end is a reef, apparently half the size of Kossol Reef, marked by heavy breakers. The channel between Kossol Reef and the reef extending northward of Babelthuap Island is about 5 miles wide.

Babelthuap, *Baubelthouap*, or *Baobeltaob* (the upper sea, in the Pelew language), is the largest of the Pelew Islands, and is 20 miles long, North and South. In its northern part, in lat. $7^{\circ} 36\frac{1}{2}'$, is *Mount Aremolungui*, 1,968 ft. high, from the summit of which Lieut. Macluer could see the whole group. Cape Artingal, its N.E. extremity, lies in lat. $7^{\circ} 40\frac{1}{2}'$ N., long. $134^{\circ} 38\frac{1}{2}'$ E.,

and just to the southward of it is the village of Molegojok, with a long stone pier reaching nearly to the edge of the reef.

It is (or was) divided into several districts, of which *Artingall*, *Emmelagui*, and *Emerings*, are the most considerable. Three small islands, *Arteck*, *Kattou*, and *Oorokoo*, lie near the North point of the island; and an island of considerable length, North and South (with rocky islets along its East side), lies on the S.E. side of the South point, from which it is separated by a very narrow channel. The East side of Babelthuap is fronted by a barrier reef, which commences off the South point of the above island, and about 2 miles S.E. by E. from the East point of Corror. The long detached reef, which forms *Armijtoakl Passage*, or *New Harbour*, lies outside of this. In Lieut. Macluer's plan, 1793, there appears to be good anchorage in New Harbour; but Malackan Harbour is the best, and the only one which should be resorted to by trading vessels. The barrier trends along the coast in a N. by E. direction to lat. $7^{\circ} 36' N.$, where its distance from the shore is 4 or 5 miles. At Cape Artingal it is about $1\frac{1}{2}$ mile distant, and westward of this it approaches close to the shore, and then turning northward, reaches $4\frac{1}{2}$ miles from the North end of the island. These reefs must be approached with great care, as they are reported to be incorrectly charted.

Corror, or Korrer, is separated from the South end of Babelthuap by a channel three-quarters of a mile broad, with 13 to 14 fathoms in it. It is $3\frac{1}{2}$ miles in length, N.E. and S.W.; and its greatest breadth, which is near the N.E. end, is $2\frac{1}{2}$ miles. *Oluksakel*, a long, narrow, rocky island, lies close to its South side, and three others near its West point, the smallest and south-easternmost of the three being named Malackan. Corror has a tolerably high peak, by which it can be distinguished when outside the reef.

Malackan Harbour.—Between *Oluksakel* and the N.E. part of *Urukthapel*, is a good harbour, the entrance to which is through two narrow openings in the reef, or coral flat, which extends from *Urukthapel* to the South angle of *Oluksakel*. One channel passes close to the S.W. side of *Oluksakel*, and the other is over a mile to the S.W., the latter being the proper entrance channel, having a depth of 10 to 5 fathoms. There are one or two coral patches in the harbour. The best anchorage is close to the East side of Malackan, in 15 fathoms, where there is a small run of excellent fresh water. According to the survey by Mr. Gravener, of H.M.S. *Sphinx*, 1862, the pier on the East side of Malackan is in lat. $7^{\circ} 19' N.$, long. $134^{\circ} 31' 45'' E.$ When off Channel Point, the N.E. point of *Urukthapel*, and passing the reef to the north-eastward of it, vessels should keep on the eastern side of the channel, this part carrying the deepest water. In the narrow part of the channel the tides set directly through, and outside it they attain considerable strength.

Corror Harbour, to the eastward of the reef off the bluff East point of *Urukthapel*, and fronting the passages to the above harbour, is a space nearly 5 miles in length, N.E. and S.W., where there is a bank of soundings, extend-

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ing about 3 miles from the shore, on which there is good anchorage, but having some coral patches on its eastern side. A ship may anchor in about 13 fathoms with the following bearings, where she will have plenty of room to get under weigh with any wind:—Malackan Peak, N.W. by N. ¼ N.; the southern passage through the reef leading to Malackan Harbour, N.W. ¼ W.; and the East extreme of the islands south-eastward of Babelthuap, N.E. ¼ N. Inshore of this the water deepens to 20 fathoms.

The channel between the South end of Babelthuap and Corror is three-quarters of a mile wide, and is navigable from sea, round the East and North sides of Corror, to the King's village, near its western point, with a depth of from 10 to 25 fathoms in it; but on account of a reef lying to the eastward of Corror, fronting the entrance, and several coral patches within this reef, it is too intricate a passage for a stranger to attempt.

The Island of Coror, although small, is the most important of the group, being the seat of government. The king and chiefs are most friendly and hospitable to foreigners, particularly to the English, who will receive every protection while within the limits of their jurisdiction. Abba Thulle, the king, nominally claims sovereignty over the whole group; but it is only by force of arms that he is able to uphold his supremacy. The inhabitants of the northern and eastern districts of Babelthuap do not acknowledge his authority, and are often at war with Coror. Vessels trading here should not dispose of fire-arms to any but the Coror people.—*Chayne*.

In 1893, H.M.S. *Esperanza* passed inside the reef North of Corror Island, and anchored off the villages of Ackashar and Molegojok. The reefs are very imperfectly known, and the coral heads inside them numerous, some of them being exceedingly small. Off Ackashar, which is 1½ mile South of Molegojok, there is a narrow and intricate passage through the reef, and about 4 miles farther to the southward there is a good and safe opening.

Urukthapel, to the South of Corror, is of a very irregular form, its greatest extent being 5½ miles, E.S.E. and W.N.W. It is moderately elevated, very rocky and barren, but covered with wood. The eastern shore is cliffy, and from its eastern high bluff patches of reef extend to the southward, with good passages between, until about a mile to the southward of the parallel of the North point of Eil Malk, where it becomes continuous for some distance, reaching about 4 miles East of the S.E. point of Eil Malk. There is anchorage within this reef on the East side of Eil Malk, but it must be difficult to get out of with a N.E. wind. The N.W. side of Urukthapel forms a bay, the shore of which is lined with small islets, and there are also several in a bay on its S.E. side. The passage between Urukthapel and Eil Malk is half a mile wide. The South point of the former is in about lat. 7° 14' 30" N., long. 134° 28' E. Urukthapel was not inhabited.

Eil Malk, the *Errakong* of the old chart, lies to the S.E. of Urukthapel; its S.E. point is in lat. 7° 11' 30" N., long. 134° 27' 30" E. The reef which

surrounds the two islands on the East side forms to the N.E. of Eil Malk a very excellent port, which has two entrances, one from the East, the other from the West. The former is round the South end of Urukthapel, between it and Eil Malk and some small islets; but as it is not more than half a mile broad, and is not well known, it cannot be recommended to large ships. But to make up for this, there are to the West of the island two other passages across the reef, which may be preferable to it; the first, stated to lie in lat. $7^{\circ} 14\frac{1}{2}'$, is three-quarters of a mile broad; the second, $1\frac{1}{2}$ mile to the southward of it, is much narrower than the former, but Lieut. Macluer passed it in his vessel. On Capt. Knorr's chart only one passage is shown from the West, in $7^{\circ} 18' N.$

Orolong or *Aulong*, a small island not more than $1\frac{1}{2}$ mile in length, lies off the N.W. point of Urukthapel. Macluer first anchored near this island, and then steered to the S.E., along the coast of Urukthapel, to reach Errakong Harbour. The centre of the island is in lat. $7^{\circ} 18' N.$, long. $134^{\circ} 25' E.$

At 3 miles southward of the S.E. point of Eil Malk is a good channel through the reef, named *Denges Passage*. On its South side is the small island of Earakong, between which and Pililu are three other small islands lying near the edge of a continuous reef.

Pililu, or *Pelelew*, a pleasant and fertile island, lies 14 miles S.W. $\frac{1}{4}$ S. from Eil Malk, and is 3 miles long, N.E. and S.W. Between its North extremity and Eil Malk, on the western reef, there lie, according to Macluer's chart, several islands, one of which, named *Akamokum*, is separated by a reef, across which is a passage not more than a quarter of a mile broad, through which it is thought Macluer passed, as it is stated to be a good channel. At the South extremity of Pililu, the reef which surrounds the group on the West side commences, containing within its limits several islands, as mentioned above, which appear to be connected with each other by reefs and shoals. The islet off the South extremity of Pililu is in lat. $6^{\circ} 58' N.$, long. $134^{\circ} 16\frac{1}{2}' E.$

Northward of the parallel of Aulong Island, the western reef appears to be continuous to lat. $7^{\circ} 37'$, long. $134^{\circ} 30'$, and here is a narrow channel named *Aremolunguj Passage*, leading to the interior lagoon, with anchorage inside. Mount Aremolunguj bearing E. $\frac{1}{4}$ S. leads in, a curious peak appearing open to the right of the summit. From hence there is a deep passage between the reefs to Malaekan and Korrer. At 3 miles farther northward is Woodin Passage, and at the North extremity of the reef off Babelthuap is *Kavasak Passage*, leading to the southward.

Angaur, the south-westernmost island of the Pelew group, is low, and is 4.1 miles in length, N.E. and S.W., the channel which separates it from Pililu being 5 miles broad, and safe, but there are no soundings, the two extremities of the islands being steep-to. Capt. Ibargoitia, who beat through to the westward with a westerly wind, could find no bottom even at a mile off the shore. He sent off a boat to the South end of this island to procure water, but it could

not approach within 2 cables, on account of the shallowness and the surf. The natives attempted to serve them, by bringing some off in their canoes by means of the casks, which were carried half a mile into the woods; but they brought but little, and that not good.

Capt. Ibargoitia, who calls this island *Niaur*, determined the latitude of its S.W. point to be $6^{\circ} 53' 55''$ N., long. $134^{\circ} 31'$ E., but more recent observations place the islet close off it in lat. $6^{\circ} 50'$, long. $134^{\circ} 10'$.

At $1\frac{1}{4}$ mile to the West of the S.W. point of this island Lieut. Macluer found a bank with 10 fathoms water; and in 1806 the same commander, in the ship *Mangles*, found a reef extending half a mile from this low sandy point; but Capt. Horsburgh, who passed close to the point in the *Anna* in the same year, did not see it, so it was supposed not to exist.

Capt. McClellan, when passing around the South end of Angaur, at about 2 miles distant, saw breakers and a few black rocks show occasionally for three-quarters of a mile off the South point, and also a few for a good half a mile farther.

The archipelagoes to the southward of the Caroline Islands, consisting of the Solomon Islands, New Ireland, New Britain, the Admiralty Islands, &c., are described in our South Pacific Directory; but as the northern coast of New Guinea, although South of the Equator, may be considered as the southern limit of the North Pacific, that coast and the islands will be briefly alluded to here.

Anchorite Isles.—Anachoretas Island was discovered by Bougainville, Aug. 7, 1768, in lat. $0^{\circ} 50'$ S., long. $145^{\circ} 30'$ E. H.M.S. *Alacrity* visited this group in 1874. They are described as five or six in number, occupying a space of about $2\frac{1}{2}$ miles in a N.E. by N. and S.W. by S. direction; they are low and flat, thickly covered with cocoa-nut trees, and connected to each other by the reef. The northern island is the largest, being about half a mile long. Off the North end of the group a tide-rip is caused by the strong current setting to the westward around the end of the reef. There is a boat entrance across the reef, near one of the southern small islets; the canoes came out over it through the surf. The water inside the reef appeared discoloured and shallow. No anchorage was found.*

* **MONKS ISLANDS** (*Los Monjes*).—Four small, low islands, which extend nearly 5 miles in an East and West direction. Maurelle first saw them in 1781, and determined their position to be in lat. $0^{\circ} 57'$ S., long. (corrected) $145^{\circ} 41'$. Capt. Hunter also saw them.

The assigned position was passed over by H.M.S. *Alacrity*, in 1874, without observing any sign of them from the mast-head. They must be the same as the Anchorite group. The brigantine *Cowan*, in 1874, also passed over it without observing them.

The natives somewhat resemble the Chinese in features, being of a light colour, with long, straight, black hair, which they wear closely rolled up on the top of the head. They are well-built men, but apparently cunning and treacherous.

Commerson Island.—Another low island was seen from the mast-head of Bougainville's vessel, at 8 miles distant, and named Commerson Island. It is 15 miles W. by N. from the northernmost of the Anachorettes, and in lat. $0^{\circ} 40' S.$, long. $145^{\circ} 17'$. Capt. von Schleinitz, of the German vessel *Gazelle*, 1875, found there were two islands, covered with large trees and cocoa-nut palms; the S.W. island is the larger of the two, and nearly flat.

Two small islands were reported, in 1877, on the Equator, in long. $146^{\circ} E.$, each being about half a mile in extent, connected by a reef, uninhabited, and covered with low trees.

Boudeuse Island was named by Bougainville after his ship, August 9, 1768. It is low, and in lat. $1^{\circ} 26' S.$, long. $144^{\circ} 34' E.$

L'Echiquier (the Chess-board), so named by Bougainville, consists of a large collection of islets. D'Entrecasteaux placed upwards of thirty on his chart, but states that it is probable that in the North part of it many were not seen. They are only a series of low, flat islets, covered with wood, all appearing to be connected by reefs. The South point is in lat. $1^{\circ} 40' 30'' S.$, long. $144^{\circ} 3' E.$ In 1883, observations made on H.M.S. *Espiegle* placed their N.E. extreme in lat. $1^{\circ} 6'$, long. $144^{\circ} 30'$, and the N.W. extreme in lat. $1^{\circ} 3'$, long. $144^{\circ} 24'$.

This group is enclosed by a narrow reef, through which there are several passages, the one chiefly used being on the N.E. side. During the visit of the schooner *Franz*, in 1872, the number of islands of the group counted were fifty-three. The natives, amounting to about 800, are of a dark copper colour, with long stringy hair, and are frequently at war with the Hermit islanders.

Los Eremitanos, or Hermits, were seen by Maurelle when 24 miles distant. They are described by D'Entrecasteaux as being high in the N.W. part, and seemed to leave considerable intervals, but, on a closer approach, they terminate in low lands, and are enclosed in a very narrow belt of sand, within which is a large space of still water. They are inhabited; the natives came off in canoes, and apparently were friendly.

The group consists of seventeen islands, surrounded by a large reef, the exterior limits of which extend about 10 miles North and South, and 13 miles East and West, and stretch about 6 miles from the shore of the largest island. It was examined by the officers of H.M.S. *Alacrity*, in 1874.

Loof Island, about 500 ft. high, lies near the centre of the group, and is the highest land in the vicinity. There are two native towns, one on Loof, and one on Geloon Island. *Pémé*, the N.E. islet, is in lat. $1^{\circ} 28' 50'' S.$, long. $145^{\circ} 5' 45'' E.$

There are five passages through the reef; the N.W. passage, the broadest, is about 1 mile wide, the anchorage generally used being on the North side of

Loof Island. The *North passage* lies N.W. by W., 4 or 5 miles from Tet or Zet, a small island lying off the North extreme of Loof Island; this passage is narrow, with generally a confused swell setting into it.

Alacrity Anchorage, formed by the reef on the N.E. side of Hermit Islands, affords good shelter in 8 to 10 fathoms, sandy bottom; there are two passages leading into it, the northern named Coeran, and the southern Sabben Passage. *Coeran Passage*, about $1\frac{1}{2}$ cable wide, is separated from Sabben Passage by a reef about 400 yards in extent, to the N.N.W. of which is the anchorage; the inner part of Sabben Passage is contracted by a shoal with 3 ft. water on it. At the anchorage the only tide that is felt is for about four hours at low water, when it runs nearly 3 knots an hour in a south-westerly direction, and there appears to be only one tide in 24 hours.

It would not be advisable to attempt either of these passages under sail during the strength of the tide, without a commanding breeze, as the tide-rips render it difficult to discern the reefs; and shoals may exist that have not been seen.—*Lieut. F. W. Sanders, H.M.S. Alacrity.*

Matty and *Durour Islands* are two small, flat islands, discovered by Carteret, September 19, 1767. According to D'Entrecasteaux, the latter is in lat. $1^{\circ} 33' 40''$ S., long. $143^{\circ} 12' 30''$, and the other in lat. $1^{\circ} 46' 0''$ S., long. $142^{\circ} 56''$. Carteret places them in lat. $1^{\circ} 43' 21''$, long. $143^{\circ} 2' E.$

Tiger Island is a discovery of Capt. Bristow, in 1817, and communicated by him to Mr. Purdy. It is about 6 or 7 miles in length, East and West, and inhabited by a ferocious race of savages. Lat. $1^{\circ} 45' S.$, long. $142^{\circ} 2' E.$

THE NORTH COAST OF NEW GUINEA.

We cannot here enter into any general description of this extensive island, or of the explorations which have been made by various European travellers, a full account of which will be found in the "Proceedings of the Royal Geographical Society."* The S.E. coasts are described in our South Pacific Ocean Directory, and the following brief description will connect that with the coast described in the Indian Archipelago Directory. The N.W. coast, westward of Humboldt Bay, was surveyed by Captain Zwaan, of the Dutch vessel *Soerabaya*, in 1875-6.

On April 4th, 1883, Mr. H. M. Chester, the resident magistrate at Thursday Island, hoisted the British flag at Port Moresby, and formally took possession, in the name of H.M. Queen Victoria and of the Government of Queensland, of all that portion of New Guinea and the adjacent islands, lying between the meridians of 141° and $155^{\circ} E.$, thus including the Louisiade Archipelago. In

* In Part 2 of Volume I. of that Society's Supplementary Papers, will be found a valuable compilation, entitled "A Bibliography of New Guinea," by the late Mr. E. C. Blye, F.Z.S., Librarian, 1884.

May, 1885, an arrangement was come to between Great Britain and Germany, by which the North coast, between Mitre Rock, in lat. 8° S., and the Dutch boundary, in long. 141° E., was ceded to Germany, and this is now the territory of the German New Guinea Company. At the same time a German protectorate was established over New Britain, New Ireland, and the islands included in the area between long. 141° and 154° E., on the Equator, and the line of lat. 8° S. to the coast of New Guinea.

The natives of this coast belong to the Melanesian or Papuan race. Although in many places wild, suspicious, and excitable, yet, when treated with tact and patience, very friendly relations have been established with them.

DAMPIER STRAIT separates New Guinea from New Britain, and is described in our South Pacific Directory. The best channel through it is on the New Guinea side, keeping the beach in sight, 6 or 7 miles distant.

Cape King William is difficult to define, the coast rounding gradually and preserving its steepness. The part taken for Cape King William is a slightly projecting point, with a village close to the northward of it, in about lat. $6^{\circ} 5' S.$, long. $147^{\circ} 40' E.$

Mount Cromwell, about 8 miles S.W. of Cape King William, rises from the eastern part of the immense Finisterre Range to a height of 7,700 ft., and takes the shape of a blunt cone, apparently covered with tropical forest. *Basilisk Gorge* is a huge break in the mountains, about $6\frac{1}{2}$ miles north-westward of Mount Cromwell. No bottom with 100 fathoms of line could be found anywhere along this coast, at distances varying from $1\frac{1}{2}$ to 3 miles from the shore, and the water had the appearance of being deep close up to the beach.

Mount Disraeli is a sharp, remarkable cone, 11,000 ft. high, situated in about lat. $5^{\circ} 58' S.$, long. $146^{\circ} 29' E.$ **Mount Gladstone**, also conical, but of blunter shape than Mount Disraeli, was found to be about 11,400 ft. high. It is in about lat. $5^{\circ} 56' 30'' S.$, long. $146^{\circ} 24' 30'' E.$ These were the two highest peaks of the Finisterre Range sighted by H.M.S. *Basilisk*, 1874. From long. $146^{\circ} 30' E.$ the coast, steep-to, continues its W. by N. $\frac{1}{2}$ N. trend for about 32 miles to Cape Rigny.

ASTROLABE BAY was not visited by H.M.S. *Basilisk*, but from information supplied by M. Miklukho-Maclay, an accomplished Russian ethnologist and traveller, who had stayed there for about twelve months, it was ascertained that the bay has about 83 villages around its shores, containing in all about 4,000 inhabitants, among whom as many as twelve dialects were spoken. *Gabima River* flows into the South side of the bay. The inhabitants were generally friendly.

Astrolabe Bay, so named after D'Urville's vessel, lies between *Capes Rigné* on the East, and *Duperré* on the N.W., about 24 miles apart, the depth of the gulf being about 18 or 20 miles. The Finisterre Mountains become lower when near the bay, which is completely surrounded by a line of mountains, even in the sight of the bay. Capt. B. Moore visited the bay in November, 1878, in

charge of the barque *Courier*, and speaks of the anchorage in the N.W. corner as being of very doubtful utility.

Port Constantine, at the head of Astrolabe Bay, is about 2 cables in diameter, with anchorage in about 28 fathoms two-thirds of a cable southward of the North point, which is in lat. $5^{\circ} 29' 53''$ S., long. $145^{\circ} 46' 8''$ E.

At 16 miles northward of Port Constantine is an indentation in the coast, with some islands off it, forming *Friedrich Wilhelm* and *Prinz Heinrich Harbours*, which can be approached by the channel southward of Fischel Island, the southern and largest, on the West side of which there is anchorage in 11 fathoms. Friedrich Wilhelm Harbour is an inlet extending to the southward, at three-quarters of a mile westward of Fischel Island, and affording sheltered anchorage in 10 or 11 fathoms. Prince Heinrich Harbour lies half a mile northward of the entrance of the latter, and affords anchorage in 7 or 8 fathoms, sheltered by several islands and reefs.

Cape Croisilles, a well-marked promontory, lies 10 or 11 miles North of Cape Duperré.

After passing Cape Rigny, the *Basilisk* steered about N. by W. $\frac{1}{2}$ W., passing mid-channel between Cape Croisilles and Dampier Island, thence along the N.E. coast of New Guinea, outside Vulcan Island and the Schouten Isles, calling in at Humboldt Bay; after which a course was steered to pass about 20 miles northward of Cape D'Urville, and North of the Mysory Islands, close South of Providence Island, through Dampier and Pitt Straits, to Amboyna.

Long Island, in lat. $5^{\circ} 20'$ S., long. $147^{\circ} 10'$ E., is divided by a deep valley into two parts; it is apparently uninhabited. The southern portion rises to a high conical peak, estimated at from 2,000 to 4,000 ft. high, which D'Urville named *Cerisy*; the northern consists of three peaks grouped together, and not reaching to quite the same height as the southern. *Reaumur Peak*, at its North end, appears to have been a volcano. A reef extends off the western point of Long Island. In January, 1885, breaking reefs were observed from *M.S. Dart*, 10 to 14 miles S.W. of Long Island, one of which had a bank of sand and coral on it.

Crown Island, so named by Dampier, lies about 7 miles north-westward of Long Island. It is about 4 or 5 miles in circumference, and has rather a level summit, 2,000 ft. high.

Sir R. Rich's Island of Dampier lies to the N.E. of Cape Duperré. It is of a similar nature to those already described, and resembles more particularly Crown Island, but is a little larger and not quite so high.

In the space between Rich and Crown Islands breakers were sighted by Capt. W. Symington, S.S. *Hankow*, March 10, 1877; he placed the position of the centre of the breakers in lat. $4^{\circ} 55'$ S., long. $146^{\circ} 50'$ E., and estimated their extent at about a mile each way.

Dampier Island, which is nearer the coast, being 6 or 7 miles N.E. of Cape Croisilles, is certainly not less than 5,000 ft. high, in the form of a cone, pointed

at the summit, but enlarged at the base to 36 or 40 miles in circumference. Although it appeared capable of cultivation, no sign of inhabitants was seen from the *Astrolabe*.

Franklin Bay is 32 miles N.W. of Cape Croisilles, and is limited on the North by Cape Gourdon, which forms a well-marked promontory, though slightly elevated. In general, in proceeding to the westward, the coast sensibly decreases in height.

Vulcan Island is an immense cone, clothed with the most beautiful vegetation, and is not more than 12 miles in circumference. It is tolerably well fixed in position, and nothing can render navigation more simple and easy than these peaks planted on the surface of the ocean, serving as beacons for ships to steer by in passing along an almost unknown coast. At 2 miles to the N.W. of *Vulcan Island* is *Aris Island*, very much smaller, but still very high.

Pallas Reef was reported, in 1878, by a barque of that name, to be situated in lat. $3^{\circ} 37' S.$, long. $145^{\circ} 40' E.$, or about 50 miles from the coast of New Guinea, and the same distance eastward of the Schouten Islands. The *Pallas* passed close to the reef, the depth upon which was estimated at a few feet.

Schouten Islands, which lie off this part of the coast, are eight in number, extending upwards of 100 miles to the westward, and appear to be uninhabited. They are very high and conical, which denote an igneous origin. Their height contrasts singularly with the low elevation of the land of New Guinea near them. They are covered with wood, and the mainland, very low near the sea, is mountainous within. Mr. Powell found good anchorage pretty close to the shore of *Broken Water Bay*. The natives were very timid.

Victoria Bay, on the western side of *D'Urville Island*, in long. $143^{\circ} 28' E.$, was visited and surveyed by Sir E. Belcher, in H.M.S. *Sulphur*, July, 1840. It is of nearly circular shape, the entrance, about 6 cables wide, being on the N.W. side; it is about $1\frac{1}{2}$ mile in length, North and South, by about 7 cables in breadth, and has regular depths, varying from 9 to 30 fathoms, over a bottom of tough dark mud, affording a snug and picturesque anchorage. Streams of fresh water abound, and wood is plentiful. The natives were friendly.

At 42 miles West of *Bertrand Island*, the westernmost Schouten Island, is a group of islands and lagoon reefs, westward of *Passier Point*, lying very near the coast, named *Sainson*, *Faraguet*, and *Dudemaine Islands*. The two first are low, and covered with large trees. *Dudemaine Island* only has a small hill on its western end, of 100 or 200 ft. in height, which may be distinguished at a considerable distance among the surrounding low land.

At this part the belt of low land which lines the coast seems to form a large valley between two chains of very high mountains. This configuration would lead to the presumption that a considerable river would flow through this valley. The coast of New Guinea, beyond these, offers nothing agreeable in its aspect. At one part it rises in steep cliffs, and breakers seem to extend a mile off the shore. Far in the interior the summits of very high mountains may be seen.

At 7 or 8 miles in the interior *Mount Eyries* raises its double peak above the clouds, in long. $141^{\circ} 15'$. The *Astrolabe* was here drifted within half a league of the land, and from the calm was obliged to anchor before a small cove.

While lying near *Mount Eyries*, fifteen canoes, each carrying from three to eight natives, put off and surrounded D'Urville's ship. There was not the slightest doubt of their hostile intentions. From this part of the coast the imposing summit of *Mount Bougainville* becomes visible in the West, raising its head a considerable height above the surrounding mountains. The boundary between the Dutch and German portions of New Guinea lies close eastward of *Mount Bougainville*.

Humboldt Bay, thus named by Captain D'Urville, lies to the West of this mountain. It penetrates deeply into the coast, particularly to the S.E. Its opening was about 4 miles in width. On one side the *Cyclops Mountains*, and on the other *Mount Bougainville*, stand like gigantic sentinels, pointing out the entrance to *Humboldt Bay* to the navigator at the distance of 60 miles. To the West of *Mount Cyclops* the coast descends with a gentle slope to the beach, and has some landing spots, with points more or less projecting.

Humboldt Bay, in lat. $2^{\circ} 40' S.$, long. $140^{\circ} 42' E.$, may be recognised without much difficulty, *Point Bonpland* on the eastern side being bold, about 700 feet high, and cliffy on its northern side. The *Basilik* struck soundings in $4\frac{1}{2}$ fathoms in entering, over a bottom of sand and coral, when the following were the bearings taken:—*Point Bonpland*, S. $40^{\circ} E.$; *Point Caillie*, N. $35^{\circ} W.$; and a point at the head of the bay resembling a peninsula, S. $72^{\circ} W.$ Close to this position anchorage was found in 16 fathoms. An uneasy swell sets into the bay, breaking heavily upon the beach, which has a wild, dreary aspect. The natives were very dark-skinned, bold, and noisy.

Caillie Point, the North entrance point of *Humboldt Bay*, is a promontory 500 ft. high, projecting in a S.S.E. direction from the mainland, to which it is joined by a low neck. *Challenger Cove*, at the N.W. part of *Humboldt Bay*, is formed by *Caillie Point* and a point $1\frac{1}{2}$ mile to the S.W. of it.

H.M.S. *Challenger*, in February, 1875, anchored in 19 fathoms, with *Caillie Point* bearing N.W. by N. $\frac{1}{4}$ N., distant about $1\frac{1}{2}$ mile, but the swell from the northward causing the ship to roll considerably, an anchorage was obtained in *Challenger Cove*, in 36 fathoms, stiff clay, with the South extreme of *Caillie Point* bearing E. $\frac{1}{4}$ N.; *Observation Islet*, South, distant $1\frac{1}{2}$ cable; and *Village Islet*, S.W. $\frac{1}{4}$ S.; but the northern part of *Challenger Cove* appeared to afford a better anchorage, being landlocked, with apparently no sign of shoal water; it was, however, not examined.

Matterer Bay, which lies about 42 miles westward of *Humboldt Bay*, is rather deeper than any preceding. To the West of this inlet a low point, covered with trees, *Point Brama*, projects considerably to the N.W.; and beyond the coast again recedes, forming *Walckenaer Bay*. In the rear of these is a high mountain (*Mount Benoist*). At 50 miles to the West is another

lofty chain, to which D'Urville gave the name of *Gauttier Mountains*, after the great French hydrographer. Mr. Powell says the coast between Humboldt Bay and Point D'Urville is for the most part high, rocky, and rugged, though much broken into bays and creeks, but parts (and these appear to be the mouths of streams) are low and swampy, having thick forests of mangrove bushes.

"In front of, and at 2 or 3 miles distance from, the low beach in front of the Gauttier Range, several small islands followed each other. The largest, Merat Island, is not more than 3 or 4 miles in circumference. At the distance we passed them, about 8 miles, they appeared to be covered with clumps of coconut and other trees. At 20 miles farther are the *Arimes Islands*, three small islets; when 12 miles distant they appeared as a single island, moderately elevated and well wooded. The chain of the Gauttier Mountains here terminates on the coast. Farther to the West the land of New Guinea is very low, and can hardly be distinguished at the distance of 12 or 15 miles. The great River *Ambernoh* or *Rechussen* debouches here, forming a large delta, and sending a large volume of turbid water into the sea.

"I consider, then, that it is a positive fact that these waters proceed from some considerable river, which discharges itself into the sea on this part of the coast. Bougainville observed the same thing in this part, and from it drew the same deduction. Precisely in this part of New Guinea the land forms a low point, Point D'Urville, very far advanced into the sea, and everything tends to the belief that it is formed by the outlet of a considerable stream."—*M. D'Urville*.

In 1884, Mr. D. F. van Braam Morris, Dutch Resident of Ternate, ascended this river for some distance in the steamer *Havik*. He entered by the most northerly mouth, in lat. $1^{\circ} 25\frac{1}{2}'$ S., long. $137^{\circ} 56'$ E., the entrance of which was 4 cables wide, with a depth of 4 to 7 fathoms in it. The steamer ascended against a strong current for about 60 miles, when the depth suddenly shoaled to $2\frac{1}{2}$ fathoms, and it was thought that even a steam-launch could not penetrate much higher than this. They met with no opposition from the natives. The numberless openings on the East coast of Geelvink Bay, between lat. $1^{\circ} 20'$ and $2^{\circ} 30'$ S., are, with the exception of the Aiberan and Kei Rivers, but outlets from inland lagoons.—(See *Proceedings of the Royal Geographical Society*, March, 1885, pp. 172-7.)

Point D'Urville is very low and projecting, probably islands; according to the observations made in the *Astrolabe* by M. Jacquinot, it is in lat. $1^{\circ} 24'$ S., long. $137^{\circ} 47'$ E. *Stephen Islands* are placed off it in lat. $0^{\circ} 20'$ S., long. $137^{\circ} 35'$ E., a doubtful position.

GEELVINK BAY is the very extensive bay of which Point D'Urville may be said to be the easternmost point. We shall not describe it here, but shall terminate our notice of New Guinea with Port Doreï or Dory, at the N.W. point of the bay. Off its mouth are some very large islands, *Jobi Island*, *Mysory* or *Schouten Islands*, and others, all very imperfectly known.

The Italian traveller, Dr. Beccari, who visited this bay in 1875, reports that

it is smaller than is shown upon the Admiralty charts, and does not extend so far to the southward. The village of Waisaru, situated at the head, apparently upon the most southern part of its shores, was found to be in lat. $3^{\circ} 12' S.$, instead of $3^{\circ} 45' S.$, as has hitherto been supposed.—*Geographical Magazine*, February, 1876, p. 39.

Point Geelvink lies about 50 miles south-westward of Point D'Urville, and here, perhaps, the immense bay of the same name may be said to commence. West of this is the extensive island of Jappen or Jobi, and between is a smaller one, which nearly closes the passage, and was named by D'Urville, after one of his officers, Quoy Island.

Krudu or *Quoy Island* is 8 miles long, East and West, and moderately elevated, well wooded, and pleasing in appearance. A channel of only 3 miles in breadth separates it from Point Geelvink, formed by a moderately high hill. A channel of the same breadth separates it from the West end of Jobi, which descends in a very gentle slope to the sea.

Trastors Islands lie to the North of Jobi, and off the East point of Mysory Islands, forming the North side of the Strait of Jobi or Geelvink. They are small and low.

Jobi or *Jappen Island*, which lies in the opening of Geelvink Bay, according to M. D'Urville's chart is about 90 miles in length, lying nearly East and West. The *Astrolabe* only sailed along its northern side. The land on this coast is high, steep, and covered with woods, without any openings. High mountains form the central ridge, some peaks rising to a height of 2,500 feet. This aspect is preserved in the most uniform manner, and throughout its whole extent it did not appear to offer a single cove or creek fit to receive a large ship. The mountains of Jobi decrease in altitude on nearing its western extreme, and its West cape is separated from Bultig by a channel 6 miles in breadth.

Ansus Harbour, on the South side of Jobi, at about 25 miles from its West end, is formed by Kaiari Island, which is about 1 mile in extent, lying 2 to 3 cables off shore. The town has a population of about 3,000, and is built on the coral reefs on the North side of the harbour. Excellent water may be obtained at the waterfall abreast the West end of the island, where there are two trading stations, but no supplies. The harbour is approached from the south-westward by a channel, 4 cables wide between the rocks, between Kaboj and Miosansus Island, in which there is no bottom at 10 fathoms. There is anchorage in 9 to 12 fathoms, with the North end of Kaiari bearing East; and also abreast the waterfall.

Bultig or *Hump Island* is hilly, of an irregular form, and 10 or 12 miles in length, but not more than 4 miles broad. Three rounded islets, called the *Three Sisters*, lie near its East point, and before its West point are two similar islets, named by D'Urville the *Brothers*. *Long Island* is tolerably large, and the land in general is but little elevated. Manim Island lies off its East point.

Schouten or Mysory Islands consist of two large islands, divided by a narrow channel, the eastern named Biak, and the western Koredö. Some small islands lie off the South side of the latter, and at 10 miles N.W. by N. $\frac{1}{2}$ N. from its West point is *Mofa* or *Providence Islet*. At 14 miles N.W. of Mofa is *Meskaröar* or *Danger Islet*, with a large coral reef extending about 10 miles N.N.W. of it. About 75 miles E. by N. $\frac{1}{2}$ N. from Danger Islet is a bank of $4\frac{1}{2}$ fathoms, in lat. $0^{\circ} 2' S.$, long. $136^{\circ} 16' E.$

Port Dorei, Dorerei, or Dory, is situated immediately to the South of Cape Mamori, which forms the westernmost and outer point of the entrance of the great Bay of Geelvink.

The harbour is easy of access, and is entered by a channel 3 miles in length, formed on one side by the peninsula of Mamori, and on the other side by the islands of *Mana-Souari* and *Masmapi* or *Miormapi*, and two banks, which are awash. The harbour itself is not more than half a mile deep, and 200 yards in breadth, with a regular depth of $10\frac{1}{2}$ fathoms, sand and shells. Notwithstanding the confined extent of this basin, ships of any class may calculate on a safe anchorage, and sheltered from the winds and swell from the offing. But as it is surrounded by deep forests, and at the bottom of the harbour there are many mud-banks, often dry, a long stay here would doubtless be unhealthy for Europeans, especially in the rainy season. The best anchorage is in 14 fathoms, northward of the missionary house on Mana-Souari.

The inhabitants of Dorei are distributed in several villages on the borders of the sea; and there are two others on the islands Mana-Souari and Masmapi. The village on the former is named Mansinian, with a church and a school, and here the chief Dutch missionary resides. The total population of Dorei cannot exceed 1,500 souls, all of whom recognise the sovereignty of the Sultan of Tidore, who is under the suzerainty of the Dutch.

The result of the observations of M. Jacquinot has placed the Observatory at Dorei in lat. $0^{\circ} 51' 43'' S.$, long. $133^{\circ} 59' 52'' E.$ Later observations place the North end of Mana-Souari Island in lat. $0^{\circ} 54' S.$, long. $134^{\circ} 7' E.$

The following islands are but little known, and some only vaguely placed on the charts. The few particulars which are given are derived (unless otherwise stated) from our "Oriental Navigator," 1809, pp. 634—641.

ST. DAVID ISLANDS, *Pedan*, *Onata*, or *Freewill Islands*.—This group, about which there is some confusion in the old charts, was seen in the *Warwick*, East Indiaman, in February, 1761. They were represented as two distinct islands, but it is probable that one of them is intended for the Asia Islands. They are very low, are four in number, and with an islet or rock between the North and East islets. The smallest in extent seems to be the highest, and all of them are well covered with cocoa-nut trees, like most other coral atolls.

It is about 14 miles long, North and South, and of an oval shape; the surrounding reef projects about a mile from the North and South sides, but not so far on the others. It is well inhabited. The centre is in *about* lat. $0^{\circ} 57' N.$, long. $134^{\circ} 21' E.$

Carteret Reef was passed by Capt. Carteret in the *Swallow*, in 1767. He passed between the reef and *Evening Islet* to the S.W. of it, and places it in the *doubtful* position, $2^{\circ} 54' N.$, $134^{\circ} 12' E.$ It is possible that it may be the same as the next, as a depth of 2,000 fathoms has been found in this locality.

HELEN REEF was discovered in the East India Company's ship *Helen*, Capt. Seton, in 1794. He says:—It is a very dangerous shoal, lying W.N.W. and E.S.E., about 6 miles; the East end appeared a dry sand, but on the West part there were rocks a very little above water; no ground with 100 fathoms of line $3\frac{1}{4}$ miles due South of a very conspicuous part of it. I am inclined to think that the reef stretches a good way to the northward, as I saw from the mast-head the appearance of breakers running from the West end to the north-eastward. From the centre of the reef, to which I gave the name of *Helen Shoal*, Lord North Island bears $N. 75^{\circ} W.$, 40 miles.

The best account we have of it is furnished by Cap'tain Pedersen, of the *Cordelia Berian*, who came to it in October, 1858, to recover the cargo of tea from the *Lady Raglan*, wrecked on its West side.

The reef is above 16 miles long in a N.N.E. and S.S.W. direction, and 8 miles wide at its broadest part, which is near its southern end. Its interior is a basin of deep water, encircled by a narrow belt of dark heads of coral, against which the ocean swell dashes with great fury. In sailing round the reef no break was seen through its margin, or foul ground along it, except at its south-eastern point, where white or shallow water extended half a mile outside the breakers, and where there appeared to be a narrow opening into the interior. A rock, with 2 or 3 fathoms over it, was discovered lying West about a mile from the wreck of the *Lady Raglan*, and North about three-quarters of a mile from the extreme western part of the reef.

As no anchorage was found along the reef, the water being ocean deep close to, the *Cordelia Berian* remained off it under sail from October 4 to November 11, her boats bringing tea from the *Lady Raglan*. During this period the weather was generally unsettled, with heavy squalls from the W.N.W., then calms, which often placed the vessel in a critical position, the currents being strong and irregular, sometimes setting at the rate of 2 knots to the eastward (or towards the reef*), and at other times as strong to the westward. The

* The *Cordelia Berian* lying-to on the West side of the reef, where the *Lady Raglan* was wrecked.

month of October was more favourable than November; in the former the wind was steadier from the south-westward, and fewer calms; in the latter, there were calms and baffling winds, and the squalls were heavy and the current strong.

The tides ran strong over the reef, the flood to the eastward, the ebb to the westward. The flood sometimes set with such force that the men could not keep their footing in 1 foot of water. The boats were enabled at times to get across the barrier at the S.S.E. part of the reef when the tide was high, but great care had to be taken to avoid the sharp heads of coral, having 10 to 20 fathoms water close to them.

In light airs or in baffling winds a wide berth should be given to Helen Reef, for the currents in its vicinity are variable and strong, and have occasioned the loss of many vessels on it, and others have but narrowly escaped being wrecked.

The N.N.E. extreme is in about lat. $3^{\circ} 0' N.$, long. $131^{\circ} 52' E.$; the S.S.W. extreme in about lat. $2^{\circ} 46' N.$, long. $131^{\circ} 42' E.$

TOBI, *Lord North*, or *Neville Island*, was seen by the ship *Lord North*, in January, 1781, and was also seen in 1789 by the *Raymond*, and was called Neville Island from a man on board. It is $1\frac{1}{2}$ mile long, E.S.E. and W.N.W., with a reef projecting from its East end, but is bold-to in other directions. It is densely wooded, and had about 200 inhabitants, who came off in their canoes, but they are bold, and not to be trusted. Lat. $3^{\circ} 3' N.$, long. $131^{\circ} 4' E.$

MARIERE, or *Warren Hastings Island*, was first seen by the East India Company's ship *Carnarvon*, Capt. Hutchinson, September, 1761. It is about 2 miles long, North and South, and a mile wide. Like other atolls, it is low and well covered with cocoa-nut trees, especially in the northern part, but the middle and southern parts are higher. It is inhabited by people resembling Malays, who are very poor, and can afford no refreshments.

Capt. A. McClellan passed it in July, 1855, and found a detached rock off it, although it had been supposed to be clear all round. A reef stretches over a mile from both ends of Marière Island, with a rock a good mile off its N.N.E. side, showing in the hollow of the sea as a round black islet, about the size of a whale. Horsburgh expressly states that there is no danger near this island. He places it in lat. $4^{\circ} 19' 30'' N.$, long. $132^{\circ} 28' 30'' E.$

Capt. Milledge, of the *Nourmahal*, who sighted the island in 1872, says that a reef with heavy breakers extends about half a mile from the North and South ends of the island. There is a smooth beach on the western side. Some canoes came alongside, and the natives appeared to be a very inoffensive race.

ANNA, or *Current Island*, was seen by the *Carnarvon*, *Warwick*, and *Princess Augusta*, the China fleet returning in 1761. It is a very small, low

island, not more than half a mile in diameter, covered with trees, and surrounded by breakers, which run out from its South end for 2 miles. Its position may be taken, approximately, as $4^{\circ} 39' N.$, long. $132^{\circ} 4' E.$ It is very dangerous in the night, and is inhabited.

SANSORAL, or *St. Andrew Islands*, have been placed 1° too far East on the charts. Capt. Maury says that they are in lat. $5^{\circ} 20' N.$, long. $132^{\circ} 20' E.$ They were discovered by Padilla, in 1710, are two in number, and said to be connected and surrounded by a reef which is steep-to, and extends but a short distance from either island. *Kodo-kopui*, the southernmost and largest, is from 1 to 2 miles S.S.W. from Sansoral, the northernmost of the two. They are small, low, flat, and thickly wooded; and may be seen about 12 or 14 miles off. There were about 200 inhabitants on the islands, and these occasionally visit the Palau in their canoes.—*Reynolds*.

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CHAPTER XIII.

ISLANDS BETWEEN LAT. 10° AND 20° N., INCLUDING THE
MARIANA OR LADRONE ISLANDS.

CLIPPERTON ISLAND was discovered, in 1705, by a companion of Dampier's, Capt. Clipperton, who separated from him on the coast of South America to go to the Indies, in which passage he fell in with this *rock* or island. Its position, as given, was not very far from the truth. Its possession is claimed by France.

Captain Sir Edward Belcher is the first who made us acquainted with its exact character, and the following is his description of it. He made it May 8th, 1839, at the distance of 15 miles, at the dawn of day; and the sun's rays playing on its nearest face, it had the appearance of a brig close hauled.—The name, Clipperton Rock, certainly misled us, and had we made the point at night, with a fair wind, would almost inevitably have severely damaged or destroyed both vessels. I certainly should have steered to pass it to the northward, merely assuming it to be a solitary rock.

Nothing in this name could lead a seaman to imagine a high rock, placed on the southern edge of a coral lagoon island, 3 miles long, North and South, by the same East and West. Its description should stand thus:—A very dangerous, low, lagoon island, destitute of trees, with a high rock on its southern edge, which may be mistaken for a sail. This rock can be seen 15 miles, but in thick weather the low coral belt, which appears like sand, will not be distinguished until close to it. The breakers on the eastern side do not afford sufficient warning for a vessel to turn or change her course. On the northern part of the belt the land is a little raised, and appears to be clothed with something like grass.

There are two entrances (about the centre of the N.E. and S.E. sides) which

at high water may be safe; but at the moment we passed, the surf was too heavy, and the reflux showed the rocks bare. The high rock is situated in lat. $10^{\circ} 17' N.$, long. $109^{\circ} 13' W.$, at about the middle of the S.E. side, the N.W. edge of the reef being more than $2\frac{1}{2}$ miles to the N.W. of it. On the beach several large trees were observed, and an object, which was thought to be part of a vessel, near the western opening.

In the centre of the lagoon, as viewed from the mast-head, there is one hole of blue water, and a second belt is connected with rock, attaching it to the East side of the island. This literally constitutes two islands formed by its two openings; both are on the weather side of the island.

No living trees were seen, but the whole island was covered with gannet, boobies, frigate pelican, and several kinds of tern, which had also been noticed in great numbers during the previous week, at least 500 miles to the eastward.

No bottom was obtained by the *Sulphur* with 100 fathoms of line, but the *Starling* had soundings with less than 100 fathoms on the northern side.

Sharks, porpoises, and turtle, were observed together. The former annoyed us much by biting at our patent logs. They were very large, and literally swarmed. In all probability they were attracted by a shoal of file (*balistes*), and other small fish, which had been feeding off our copper since quitting the Island of Cocos.

PASSION ISLAND or Rock.—The existence of this has been the subject of much doubt, arising from the very contradictory statements as to its position. It is stated to have been discovered in the early part of the last century, by Capt. Dubocage, in *La Découverte*, of Havre, on a Good Friday, and from this circumstance it takes its name. This account is alluded to by Le Barbinaise, who made a voyage to the South Seas in 1714. The position stated is lat. $4^{\circ} N.$, long. $106^{\circ} W.$, but on Espinosa's chart it is given as lat. $16^{\circ} 54' N.$, long. $109^{\circ} W.$ This great incongruity, however, is in some measure set at rest by the following, by Lieut. Woolridge, R.N., commanding H.M.S. *Spy*:—

"On December 2nd, 1847, observed an island bearing W.N.W., which, though (as laid down) would have been 60' distant, we could only believe to be the Passion Rock. As we passed less than 30' to the West of it in July last, and did not see it, and now passed 60' to the East of it, it is possible it may be laid down 30' too far to the West.

"Latitude and longitude, from bearings and supposed distance, $17^{\circ} 11' N.$, $108^{\circ} 21' W.$ It appeared from aloft high, and peaked in several places."

However, Commander Dewey, U.S. ship *Narragansett*, searched unsuccessfully for this rock in 1873, and Rear-Admiral Almy, in the *Pensacola*, also failed to find it.

REVILLA-GIGEDO ISLANDS.

This is a small group of four islands, apparently of volcanic origin, lying to the southward of the Californian Peninsula, and discovered in one of the early Spanish voyages. Fernando de Grijalva, in 1523, named the principal island Santo Tomas, now called Socorro. The name of the group is derived from Capt. Colnett, in 1793, who gave the name of the Spanish Mexican Viceroy to them, in gratitude for the kindness he had received from him during his captivity.—(*Colnett*, p. 116). The Spaniards intended to form an establishment on them, but their natural character prevented this.

SOCOERRO, or *Santo Tomas*, is about 9 miles in length, N.W. and S.E., and about $7\frac{1}{2}$ miles in its greatest breadth. It may be said to consist of one mountain, 3,707 ft. high, which may be seen at the distance of 60 miles, and falls in gradual descent at all points on the South side. It is in a great measure covered with brushwood, intermixed with low prickly pear trees (*cacti*), and occasionally shaded with other trees of a larger growth. Some few spots of the soil are black and barren, as if fire had lately issued near it; and the top of the high land at a distance has the appearance of having been formerly a volcano. The surface is of a whitish colour, like that of the pumice stone, which was found on the shore. Neither fire nor smoke were, however, seen to issue from the island.

The vegetables found by Colnett's people were considered as wholesome; they were beans growing on a species of vine, and the molle tree, whose leaves make a pleasant and aromatic decoction. The prickly pear, an excellent antiscorbutic, grew in great abundance. Numerous land-birds, and plenty of sea-fowl, also afforded food. Fish is very abundant, but difficult to take, on account of the numerous sharks. Water is, however, not to be found, though there are many indications that some must exist, but it has not been discovered.

Capt. Colnett considered the safest anchorage, from June to December, to be in *Cornwallis Bay*, between the South and S.W. points, opposite to two white coral beaches, which are the first two in succession from the South point of the island toward the West. It is remarkable from the pinnacle rocks, 30 ft. high, which lie close off the West point of the bay. This bay is preferable in the bad season, as the wind seldom blows more than two points to the southward of East. It is necessary to anchor quite near the beach, as the water quickly deepens.

In the good season, however, that is, from the latter end of December till the beginning of June, the S.E., or *Braithwaite Bay*, is to be preferred; the anchorage here is better, and it is the only good landing-place. It is readily known, being a stony beach at the first inlet in the shore to the eastward of the South point. All other parts of the coast on the South side of the island

are iron-bound, which makes it difficult, if not impossible to land, except in very fine weather. To anchor in this bay, bring the peak to bear N.W. by N., and anchor in 10 or 11 fathoms, a quarter of a mile from the beach. According to Commander Dewey, of the U.S. ship *Narragansett*, 1874, his observation spot, at the landing-place, is in lat. $18^{\circ} 42' 57''$ N., long. $110^{\circ} 56' 53''$ W., or $2\frac{1}{2}'$ westward of Sir E. Belcher's position.

Sir E. Belcher states that Braithwaite Bay has rocky landing, the shores of lava coulé, and nothing like a beach. Neither wood nor water visible, although, from the constant clouds which hang over the high peaks, there must be a supply in some other point. Lieut. Wood examined the western bay, which is spacious, and, as goats were observed, it is probable that they find water.

"It is difficult to penetrate into the interior, even for a few hundred feet, owing to the abundance of the *cactus opuntia* (prickly pear), which make those who attempt it suffer for their curiosity. One of the crew of the *Sulphur* made himself ill from eating a large bean, which grew abundantly; but it might have been from indulging too freely, because some were cooked and eaten without injury." Two of Colnett's people were affected in the same way.

Cape Rule, the South point of Socorro, is a high bluff, surmounted by a hill 250 ft. high. *Oneal Rock*, about half a mile long, and 45 ft. high, lies 1 mile N.W. by N. from Cape Henslow, the N.W. bluff. Several other rocks lie off the coast between this and Cape Middleton, the North point, and over a mile north-eastward of the latter are two small rocks, 15 and 50 ft. high. The eastern coast is very dreary and forbidding, consisting of perpendicular bluffs from 15 to 150 ft. high, with no landing.

San Benedicto Island, named *Nublada* (cloudy) by Villalobos, in 1542, and *San Berto* by Colnett, lies 30 miles N. $\frac{3}{4}$ E. from the peak of Socorro. It is a barren rock, 3 miles in length, N.E. and S.W., and from a half to three-quarters of a mile in breadth. The surface is uneven, and its appearance romantic, but barren, with little or no vegetation. It has two peaks, the highest, 975 ft. high, near the southern end; these, when seen at the distance of 9 or 10 miles, have the appearance of two islands. On the West side is a small bay, but it was not examined. Three small rocks, 60 to 200 ft. high, lie close westward of the North point of the island, and a dangerous sunken rock lies about a mile westward of the extreme western point. Near the middle of the eastern side is a small beach, where landing might be effected. The North end of the island is in lat. $19^{\circ} 20'$ N., long. $110^{\circ} 48'$ W.

Rosa Partida, 67 miles W. $\frac{1}{2}$ N. from the peak of Socorro, is a dangerous barren rock, 110 ft. high, lying N.N.W. and S.S.E., consisting of two white pinnacle rocks, connected by a low rugged ridge 20 ft. high. It is only 100 yards in length, by 50 yards wide. The N.W. end is forked; the S.E. end is like a ragged haycock. There is a depth of 35 fathoms at a boat's length off all round; at half a mile distance, 50 fathoms; and then no bottom with 100 fathoms. It appears like a vessel under jury-masts. There is a great quan-

tity of fish, but the sharks prevent them being taken. The only inhabitants of the rock are men-of-war hawks, as at San Benedicto. Lat. 18° 59' 40", long. 112° 7' 30" W.

Santa Rosa, or Clarion Island.—We have no early account of this island, and its existence was doubted until it was seen, in 1815, by Lieut. Ponaftidin, of the Russian Company's ship *Souvoroff*, who calculated its position as lat. 18° 28' N., long. 115° 6' W. Captain Fitzgerald, of the *Alert*, saw it in his passage from Callao to San Blas. It was also seen by Captain Clark, of the American ship *Pearl*, who modestly bestowed the name of *Clarion* on it. It is called *Cloud Island* on some charts, but this is evidently the name of Nublado Island to the eastward. It is also probably the same as *Best Island* and *Freshwater Island*, placed near to Cloud Island.*

Clarion Island lies 2½ miles W. by S.½ S. from Socorro, and is a little over 5 miles long, East and West, by from 1 to 2 miles wide. It has three prominent peaks, 1,282, 916, and 996 ft. high respectively, the highest near the western end. Captain Fitzgerald describes it as being high in the West part (1,500 ft. according to Sir E. Belcher), and when it bears N.E. it shows in three summits, which give it the appearance of a group of islets. Sir E. Belcher speaks thus of it:—Clarion Island differs slightly in its features from Socorro, excepting that a whitish-coloured fresh-water lake was found at the beach, and birds were more numerous, viz., the gannet, frigate pelican, several varieties of boobies, of tern, ducks, and doves. The plants were more luxuriant, the cactus particularly so, but not so uncourteous as at Socorro—it did not entirely stop the way. No streams were noticed. Fish were very numerous, and took the bait freely, but they broke the hooks. Turtle were plentiful; two were captured. Sir E. Belcher was not fortunate enough to find wood or wholesome water in any way to justify a vessel seeking for those necessities at these islands. Possibly distress might be relieved, but nothing beyond.

The South side of the island is clear and steep-to, except off two indentations with sandy beaches, off the eastern of which breakers extend nearly half a mile. *Sulphur Bay*, the western, affords tolerable anchorage in northerly winds, in 12 or 13 fathoms, 3 cables from the beach. Sir E. Belcher places his observation spot, on the East side of this bay, in lat. 18° 20' 36" N., long. (corrected) 114° 43' 19" W. With the exception of these beaches, the shores consist of perpendicular bluffs, 80 to 600 ft. high, with a few small detached rocks. Off the N.W. point is the remarkable *Monument Rock*, 200 ft. high. The current in the vicinity of Clarion Island was found setting to the southward from a half to 1 knot an hour.

* The positions assigned to most of these islands was also examined by Lieut. Caterby Ap R. Jones, U.S.N., and no indication of land discovered. Lieut. Jones was of opinion that all of them were erroneous positions of Santa Rosa Island, which, from all these positions, was in sight. They were also searched for unsuccessfully by the U.S. ship *Narragansett*, 1874.

Sir E. Belcher sought for the several islands reported near Socorro and Clarion Islands, and passed over the position of Best Island, which, if it existed within 10 miles, might have been seen; he soon after sighted Clarion Island, not far out of its position as given. Birds, principally gannet, together with broad patches of weed, were at times plentiful.

ROCA CORAL, *Roca Paredero*, *New Island*, *Misipi Island*, *New Baldayo Island*, &c.—Several islands under the foregoing names have been announced as existing between lat. $16\frac{1}{2}^{\circ}$ and 17° N., long. 133° and 136° W., but the reports have never yet been confirmed, and their existence, whether as referring to a single island, or a cluster of five islands, as has been reported, or a series of detached islands, is exceedingly doubtful.

The United States' Exploring Expedition passed through the reported area, and Sir Edward Belcher, in the *Starling* and *Blossom*, Capt. Trollope, in H.M.S. *Rattlesnake*, and others, have sought for this cluster of doubtful islands unsuccessfully; but numerous indications of land were met with, medusæ, floating sticks, frequent showers, frigate birds, &c. Sir Edward Belcher says:—"As these latter birds do not go far from land, I am disposed to believe some one of these reports to be well founded, but the position erroneously determined. So many assertions can hardly rest on imagination."

JOHNSTON ISLANDS were discovered December 14, 1807, on board H.M.S. *Cornwallis*, Capt. Charles James Johnston. The discovery and place of the group were announced by Lieut. William Henry Smyth, at that time an officer on board the *Cornwallis*, hence the group is sometimes called by the name of the frigate. The original observations place them in lat. $16^{\circ} 53' 20''$ N., long. $169^{\circ} 31' 30''$ W. They are described by Wilkes, 1840, as a lagoon surrounded by an extensive reef, extending N.E. and S.W. 10 miles, and 5 miles broad. On the N.W. side are two low islets; the westernmost, in lat. $16^{\circ} 48' 0''$ N., long. $169^{\circ} 45' 36''$ W., is covered with bushes, but no trees; the other is only a sand-bank. This reef lies deep.

They were examined in 1859 by Lieut. J. M. Brooke, of the U.S. schooner *Fenimore Cooper*. He landed on them, and obtained excellent equal altitudes, and his observations, which should be preferred, place the flagstaff on the West islet in lat. $16^{\circ} 44' 48''$ N., long. $169^{\circ} 39' 35''$ W. He says:—"It is a lagoon island, the reef being in the shape of a quadrilateral, $3\frac{1}{2}$ miles in a N. by E. $\frac{1}{2}$ E. and S. by W. $\frac{1}{2}$ W. direction, and $3\frac{1}{2}$ miles N.W. by W. $\frac{1}{2}$ W. and S.E. by E. $\frac{1}{2}$ E. On it are two islets, the smaller being N. 55° E. (true) from the larger, and distant 1 mile. The larger islet is about half a mile long, E.N.E. and W.S.W., and here (on the eastern side) were the huts and wharf of the Pacific Guano Company of San Francisco, who claimed possession of it; a flagstaff marked its position from the distance. The smaller islet, a mere sand-bank, is less than a quarter of a mile in diameter. Breakers extend to

North Pacific.

69

the North, nearly $1\frac{1}{2}$ mile; to the West the reef approaches the larger islet within a mile. A bank surrounds the reef, extending in a S.E. direction 5 or 6 miles, with 10 to 15 and 20 fathoms on it.

The best anchorage is three-quarters of a mile S.S.E. from the huts under the flagstaff on the larger island; in running for it, the flagstaff should be brought to bear N. by W. $\frac{1}{2}$ W., though there is nothing to prevent its being brought on any bearing between North and N.W.

The sea all round the islets is alive with fish of a superior quality; and birds are extremely numerous.*

Schjetman Reef.—In October, 1868, Captain Schjetman, of the Norwegian ship *Anna*, states that he passed a breaking coral reef, level with the surface, in lat. $16^{\circ} 8' N.$, long. $178^{\circ} 56' W.$ It was about $1\frac{1}{2}$ mile long, North and South, and about half a mile wide. In 1880, the U.S. ship *Alert* passed this position, but observed no signs of the reef.

SMYTH ISLANDS, Gaspar Rico, or Toangi, a sma" group, are the subject of some doubt as to their original discovery. On the early Spanish charts, an island, *Gaspar Rico*, is placed between lat. 15° and $16^{\circ} N.$, and in long. $170^{\circ} E.$ In 1625, the Dutch fleet, called the Nassau fleet, passed near to a low island, which they believed to be Gaspar Rico. In 1796, Don F. Quintano,

* The following are doubtful announcements which have been made of discoveries in this vicinity:—

Wilson Island, lat. $19^{\circ} 15' N.$, long. $166^{\circ} 40' W.$ *Haycrouse Island*, lat. $19^{\circ} 6' N.$, long. $163^{\circ} 33' W.$, and an island a degree farther West. Commander Skerrett, U.S. ship *Portsmouth*, 1874, searched unsuccessfully for these islands, and also for *Malloon* or *Maleone Island*, lat. $19^{\circ} 24' N.$, long. $165^{\circ} 18' W.$, which another report places in $19^{\circ} 15'$, $166^{\circ} 52'$.

An *Island*, lat. $16^{\circ} 30' N.$, long. $163^{\circ} 50' W.$, and a *shoal* 20' to the eastward, were also not found by Commander Skerrett.

A *shoal*, from whaler's report, in lat. $18^{\circ} 26' N.$, long. $173^{\circ} 24' W.$, and another *shoal* on the same parallel, and in long. $170^{\circ} 30'$.

Jane Island, lat. $16^{\circ} 10' N.$, long. $173^{\circ} 15' W.$

The ships of the United States' Exploring Expedition passed over and near to the positions of many of these islands and shoals in clear weather, and for many hundred miles on their parallel, without seeing anything.

The following are also unknown:—

A *shoal*, from whaler's report, $13^{\circ} 30' N.$, $170^{\circ} 30' W.$; an *island* $13^{\circ} 4' N.$, $168^{\circ} 28' W.$; another *island*, in $13^{\circ} 0' N.$, $165^{\circ} 40' W.$; an *island* in $11\frac{1}{2}^{\circ} N.$, $163^{\circ} 55' W.$, was not seen by the *Josephine*, Capt. Stone. They were also searched for unsuccessfully by Commander Skerrett.

Gaspar Island, $14^{\circ} 8' N.$, $179^{\circ} 0' E.$, or $15^{\circ} 0' N.$, $179^{\circ} 20' E.$ The latter position was passed over by the United States' Exploring Expedition. The same with *San Pedro Island*, in $11^{\circ} 17' N.$, $179^{\circ} 0' W.$, over which the U.S. ship *Narragansett* also passed in 1872.

in the Spanish ship *Maria*, discovered a group of five small islands, connected by rocky banks, which he believed to be *San Bartolomeo*, discovered by Salazar, in 1536.

These several discoveries evidently refer to one and the same group. On December 22, 1807, H.M.S. *Cornwallis* passed to the northward of a group of islets and rocks extending 17 miles N.N.W. and S.S.E., the centre of which was estimated to be in lat. $14^{\circ} 30' 30''$ N., long. $168^{\circ} 42' 15''$ E., from the observations of Lieut. W. H. Smyth, afterwards deservedly celebrated as the surveyor of the Mediterranean, &c. The largest and eastern of the islands received the name of *Sybillia*; the southernmost, *Petrel*; the others, *Fruitful*, *Danger*, and *Rabbit Islands*. The N.W. part of the rocky reef was named the *Rocks of Scylla*.

Captain Kotzebue saw these islands March 17, 1817, and sailed along their West side. His description entirely accords with that given by Lieut. Smyth and Capt. Quintano. His determination for the centre is lat. $14^{\circ} 42'$ N., long. $169^{\circ} 3' 30''$; but he concedes the difference, 21', between this and that of Lieut. Smyth, to the latter. They were also seen by the American brig *Bolívar*, February 9th, 1833, and then named *Farnham Island*.

Lieut. Brooke, of the U.S. schooner *Fenimore Cooper*, examined the western side in 1859; heavy weather prevented a thorough survey of the reef. This side consists of a coral wall, with some clumps of rock scattered here and there. At the northern extremity there are some clumps of rocks partly above water and partly awash, and to the southward a couple of sand-banks a few feet above water, apparently separated from the northern rocks by a channel, the whole encircled by breakers which do not run out very far. The group extends about 9 miles, N.N.W. and S.S.E.; the eastern extent was not ascertained. The reef to the westward is very low and very bold,—nearly steep-to; at the distance of a mile from the breakers, bottom was just reached at 1,000 fathoms. There appear to be some detached breakers about a mile north-westward of the N.W. extremity. Lieut. Brooke made the position of the main clump of rocks at the N.W. extremity in lat. $14^{\circ} 41'$ N., long. $168^{\circ} 56\frac{1}{2}'$ E.

According to the latest accounts, the S.W. extreme of this group is in lat. $14^{\circ} 31'$ N., long. $169^{\circ} 1'$ E. The islands are low, and thinly covered with iron-wood and bushes, and are situated upon the eastern and northern reef. The western reef consists of two parallel reefs, having a boat channel into the enclosed space which has 30 fathoms water in it. There is no passage into the lagoon even for a boat, and no anchorage.

WAKES ISLAND was discovered by the *Prince William Henry*, in 1796, and its position, &c., fixed by the United States' Exploring Expedition in 1840. It was seen by Capt. Gardner in the whale-ship *Bellona*, in 1823. He describes it as being 20 to 25 miles long, with a reef extending 2 miles from the East end,

with detached rocks to the West. It was well covered with trees. Captain Sproule saw it in 1858, in the barque *Maria*.

This danger is described by Lieut. Wakes as a low island of triangular form, 8 ft. above the surface of the sea, covered by shrubs, with a small reef around it, lying in lat. 19° 10' 54" N., long. 166° 31' 30" E. It has a large lagoon in the centre, filled with a variety of fish, among which are some fine mullet. No fresh water, and no palm or cocoa-nut trees. From appearances, the island is at times submerged, or the sea makes a breach over it. It was low water at 1^h on the moon's last quarter. The reef around is very small.

The description of Capt. Sproule agrees well with this; so that there is no doubt his island is identical with that surveyed by Lieut. Wilkes. Captain Sproule passed this locality repeatedly above and below the parallel of Wakes Island, and gives evidence that all those islands and reefs marked on the charts, under the names of Wakes, Halcyon, and Helsing Islands, are one and the same. Capt. Brown, of the missionary ship *Morning Star*, also searched for Halcyon Island without finding it.

It is thus very probable that *Halcyon Island*, said by Kotzebue to have been discovered by an American captain in lat. 19° 23' N., long. 165° 33' E., is the same as Wakes Island, because Captain Wilkes passed by its assigned position without seeing it. Krusenstern calls Wakes Island by the name of Halcyon, on this supposition. Another authority places Halcyon Island in 19° 6' N., 163° 33' E.*

In 1883, the German war-vessel *Leipzig* passed close to Wakes Island, and under very favourable circumstances its position was estimated to be latitude 19° 18' N., long. 166° 41' 15" E.

Alligator Shoal.—We have no particulars of this shoal, which is placed on the chart in lat. 15° 5' N., long. 154° 20' E.

* An island in 19° 31' N., long. 166° 35' E., as announced in the *Alta California*, another island, from whaler report, on the same parallel, being 2° farther East, and also a bank in 20° 0' N., 167° 40' E., must refer to Wakes Island. The latter bank was searched for unsuccessfully by the U.S. ship *Portsmouth*.

Besides these the following doubtful islands may be enumerated:—

San Bartolomeo Island; *Manuel Rodriguez Reef*.—An island was discovered in 1536, by Torito Alonzo de Salazar, called S. Bartolomeo, which is placed on Admiral Espinosa's chart in lat. 15° 10' N., long. 163° 43' E., without stating upon what authority. It was not found on a search of 100 leagues on the parallel assigned to it by Capt. Merlet, of the French Marine, in November, 1851. In the memoir of Admiral Espinosa, Manuel Rodriguez Reef is placed in lat. 11° 0' N., long. 141° 17' W.; but these indications are so vague that no dependence can be placed on their accuracy. It is sufficient here to mention them.

MARIANA OR LADRONE ISLANDS.

The archipelago of the Marianas or Ladrone is composed of a chain of volcanic islands, which extend in a North and South direction for a space of 420 miles, between lat. $13^{\circ} 12'$ and $20^{\circ} 32' N$. Magalhaens, the first circumnavigator, discovered them on March 6th, 1521, but he only saw Tinian, Saypan, and Aguigan. His companions in the voyage named them the "Islands of the latteen sails" (*Islas de las velas latinas*), on account of the triangular form of the sails carried by their prahus. The Spaniards named them also *Ladrones*, from the great propensity to thieving evinced by the natives, although Father Gobien, who wrote a history of the archipelago, states that they hold this vice in detestation. Antonio Galvaom mentions them under the names of *Los Jardines* and *Los Prazeras*, or Pleasant Islands.

It was in 1668 that they received the name of *Marianas*, in honour of the widow of the King of Spain, Philip IV., Maria Anna of Austria. This name has been continued to the present day, and has nearly absorbed all others given previously. In 1564 or 1565, Andreas Miguel Lopez Legaspi came hither, and proclaimed them to be the possession of the crown of Spain, but he stayed here but a very short time.

The advantage which these islands afforded to the Spaniards, by their situation on the grand track from Acapulco to Manila, and the facility in procuring fresh provisions and water here, soon induced them to take actual possession of them. Under the pretext of converting the natives to the Christian religion, they founded, in 1668, in the Island of Guahan, a mission under the direction of Padre de Sanvitores, which soon extended its influence over the other inhabited islands. The mutual good understanding, however, did not last long between the missionaries and the natives, who after some months had elapsed began to revolt against them. They attacked the fort, and killed several of the Spaniards, but European discipline and fire-arms prevailed, and they were obliged to yield. The war of extermination and the emigration to other islands so destroyed the population, that when Dampier came hither in 1686, that is eighteen years after the arrival of Padre de Sanvitores, there were not more than 100 natives on the island. Dampier says that the number had been 400, but the Spanish authors magnify them into 40,000 and upwards, a great exaggeration. It was not until 1695 that all resistance was quelled, which proves that up to this date the natives had not abandoned the hope of recovering their independence; but an epidemic finished the work of destruction, and when Anson visited the island of Tinian, he found it entirely deserted. This island, which once had a population of 30,000 men, was then only inhabited by wild hogs and cattle.

The reports of Sanvitores, also, confirm the estimates of the population. He says, among other things, that during the first year of his labours he baptized

13,000 people, and converted 20,000; but this must be overrated. The population of Guahan, according to Malespina, amounted to 4,000 people, but he does not say how many of these were of the primitive race. According to Kotzebue, there were but a single couple in 1817, at the death of whom the indigenes would become extinct. This is a sad but true picture of the mode in which the Spaniards *pacified* the natives. The last-named author also tells us that the Americans, who traded in peltry between the N.W. coast of America and China, had formed an establishment on the islands of Saypan and Grigan. For this purpose they had brought some families of Sandwich islanders to cultivate the land and raise live stock; but as soon as the Spaniards heard of this, they sent a detachment of soldiery to the infant colony, who destroyed the plantations, and carried away with them the Sandwich islanders as prisoners. M. Chamisso, the naturalist in Kotzebue's expedition, has given a detailed account of this enterprise, undertaken in 1810, by Capt. Brown, of the American ship *Derby*.

The most complete nautical account and chart of the archipelago was that drawn up by M. de Freycinet, who surveyed a portion of the southern part of the group in the French corvettes *L'Uranie* and *La Physicienne*, in 1819.* The most recent accounts of this remote (and useless) Spanish colony are given by Commander Sanchez y Zayas and Lieut. Camargo, of the Spanish Navy, and by Capt. Knorr, of the German war-vessel *Hertha*, as mentioned in the note below. To these we are indebted for many of the subsequent particulars, which are incorporated with the remarks by Freycinet.

There has been much confusion in the names of the northern islets, increased by the addition to the chart of an island which does not exist. These

* The accounts of the progress of discovery in this group will be found in *Herrera*, decad. 3, l. 7, et. seq.; *Argensola*, Conquista de las Molucas, lib. i.; *Gonzales de Oviedo*, Hist. de las Indias; *Gomara*, Hist. Gen. de las Indias; Ultimo Viage al Estrecho de Magalhães, p. 205, &c.; Anson's Voyage Round the World, by Richard Walter, book iii., chap. 2; Byron's Voyage, in Hawkesworth's Collection, vol. i., p. 116, et seq.; Wallis's Voyage, *ibid.*, vol. i., p. 279, et seq.; Portlock's Voyage, p. 317; Gilbert's Voyage of the *Charlotte*, 1788, pp. 66-7; Voyage of Governor Phillip to Botany Bay, 1789, p. 255. Observations, &c., on a Voyage to Teneriffe, Tinian, &c., in the brig *Mercury*, commanded by C. H. Cox, by Lieut. George Mortimer, 1791, p. 64, et seq.; Voyage de *L'Astrolabe et Zeeu*, tome v., pp. 202-336; Freycinet's Voyage, Paris, 1826; Navigation et Hydrog., chap. xi., pp. 190-221; and the Voyage of the Spanish corvette *Narvaez*, by her commander D. E. Sanchez y Zayas, Anuario de la Direccion de Hidrografia, iii, 1865, and a translation of the same by Lieut. MacDermott, of the French Navy, in the *Annales Hydrographiques*, 1866-7.

Among later sources of information may be mentioned the notes on Guam Island, by Lieut. Camargo, published in the Anuario for 1873, and a translation of the same by Lieut. d'Hombres, in the *Annales Hydrographiques*, 1875; and the Report of the visit of the German war-vessel *Hertha*, in *Annalen der Hydrographie*, 1876.

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discrepancies have been rectified by Commander Sanchez y Zayas, as hereafter explained.

From the statistics gathered by Commander Sanchez y Zayas, there were 4,060 inhabitants in 1800, which number increased to 5,406 in 1818; to 8,609 in 1849; and to 9,500 in 1856. But in the last-named year small-pox broke out in the archipelago, and in the course of that year carried off half the people, reducing the numbers to 4,556 souls. In 1865, the population was reckoned as 5,610, of which 4,824 were on Guajan, 335 on Rota, 18 on Tinian, and 435 on Saypan; the other islands being uninhabited. The group is under the authority of a military Governor, residing at Agaña.

The indigenous race called *Chamorro*s very much resemble the Tagals and Visayos of the Philippines, but are perhaps more indolent,—a fault compensated for by good qualities, of which sobriety and unselfishness may claim notice. The Caroline islanders, who have been imported, are naturally active and industrious.

The primitive inhabitants of the archipelago have left some memorials of their talent behind them, like those of the monuments on Easter Island, at the opposite extreme of the Pacific Islands. In Tinian these structures are remarkable. They are described in Lord Anson's Voyage, where a view is given of one, and they are mentioned by other and later visitors. Lieut. Mortimer says they consisted, in the state he saw them, of two ranges of columns, either of stone or composition, and of a pyramidal form, 5 feet 4 inches broad at the base, and 14 feet high, having large semi-globes, 5 feet 10 inches in diameter, placed on the tops, with their flat surfaces upwards. These singular structures, which are not all exactly alike, are supposed by Freycinet to be the supports of a wooden ceiling to which the roofs of the principal houses were affixed. But this opinion is not participated in by other authors, and a further examination points to the inference that they are sepulchral monuments of the former inhabitants. There are numerous similar remains on the other islands, especially at Asan, near Agaña in Guahan; but here they are smaller, and constructed of stone.

Deer and wild goats are found in abundance, and form the principal food of the Europeans (Spaniards); cows and pigs are also reared. Potatoes, maize, and rice are indigenous; and cocoa, coffee, and hemp are cultivated.

Climate.—It rains very heavily at the Marianas, and it may be affirmed that there are no dry and rainy seasons—it rains in torrents every day. The enormous evaporation of the Pacific is condensed in passing over the islands, so that with winds from every quarter rain is abundant at all hours of the day or night. The *Narvaez* was here in December and January, the period of the so-called dry season, but rain was abundant every day, and the natives were surprised at the weather being considered as wet.

The temperature is mild, and much cooler than at the Philippines, but the inhabitants declared that the heat in August and September was almost suffo-

eating. This must arise from the interruption of the N.E. trade wind, which blows throughout the year with the exception of these two months, during which the effects of the S.W. monsoon apparently reach to the Marianas. At this time there is generally a dead calm, for the monsoon itself has not sufficient force to reach the archipelago. It is therefore the season of intense heat, rain, and storms, and frequently of terrible hurricanes.

Admiral Krusenstern makes the following observations on this subject:—The Marianas lie in the region of the North tropic, and consequently in that of the N.E. trade winds. But this is not the prevalent wind. The N.E. and S.W. monsoons, which are met with in the China Sea, on the coasts of China, and near the Philippine Islands, extend as far as the Marianas, and sometimes even beyond them; so that the limits between the monsoons and the trade winds must be found somewhere near this archipelago, as is explained in a subsequent page, in treating of the winds and currents.

Currents generally following the direction of the winds, it is probable that it is also the case near the Marianas. But Capt. Golownin met with a rapid current bearing to the N.E., although the wind blew from that quarter; and a Spanish officer affirms that a similar current generally flows in this part; but this phenomenon may proceed from some local cause, and is but an exception, and does not affect the general rule.

From recent observations it is stated that the currents in the Mariana Archipelago set to the W. at the rate of about three-quarters of a mile an hour, during nine months of the year, and to the N.E. during the remaining three months.

Between the islands of Tinian and Aguijan a violent current was remarked in the *Centurion*, the direction of which was alternately S.S.E. and N.N.W. This would prove the existence of regular tides. The flood, which bore to the N.N.W., was more rapid than the ebb, and lasted longer. Pasco-Thomas also remarked, that, during the syzygies, the flood was 2 ft. less than at the quadratures, which is contrary to what usually occurs. The greatest rise of water was 8 ft.; with S.W. winds the flood rose higher than with other winds. From later observations the tides are found to be insignificant, the greatest rise not exceeding 3 ft.

Observations on the Winds, by M. de Freycinet.—We remarked that in April and May the wind at the island of Guahan almost always blew freshly from E.N.E. to E.S.E. It sprang up at break of day, became very fresh towards 8 or 10 a.m., and was calm during the night. The sky was most generally clear; sometimes it was overcast with thick clouds, which, driven with great rapidity, gave place to showers and strong gusts.

When the horizon was overcast to the S.W., N.W., and West, with a black mass, not high, the sea began to break on the inner banks at Luis Harbour. It also occurred that, notwithstanding the continuance of the easterly winds, the S.W. and westerly swell rendered the narrow passages between these reefs im-

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The monsoons are felt at the Marianas; that from the West takes place from the middle of June to the middle of October. The wind, however, only blows violently for three months of the year. Hurricanes are comparatively rare; earthquakes, on the contrary, are tolerably frequent. Of the first-mentioned scourges, there had not been one for seven years prior to our visit.

Between the years 1850 and 1875, fifteen typhoons or hurricanes were experienced at Guam, eight of them occurring in the month of November, two in February, three in April, and one in June and September.

According to Don Luis de Torres, the months of July to November are the season of bad weather, storms, thunder, and rain; and in December, January, and February, the weather is variable; March, April, May, and June, are the finest; the breeze then comes from East and N.E. The months when the winds blow strongest are August, September, October, and November; they blow at these periods from N.W. to S.W. by W., sometimes from South and S.E., but in general rather between North and West than from North itself.

Observations on the Winds, &c., by Lieut. Camargo.—The winds in these islands follow the general law of the N.E. trade wind; they are sometimes modified by the monsoons of the China Sea, on the limit of which they lie. The S.W. monsoon is only light, but the N.E. is fresher and blows longer. It lasts from the middle of October to the end of June, which is the fine season. During July and August it blows from the S.W.; it has less strength, but is accompanied by strong squalls and heavy rain. It rains sometimes during the N.E. monsoon, but it never lasts longer than three days. The N.E. monsoon is strongest during December and January. At the end of February it becomes feeble; turns to East and even, though rarely, to E.S.E.; it freshens in the latter half of March, and blows moderately. After this it dies away gradually till July, when the S.W. monsoon sets in.

Hurricanes follow here the same laws as in the China Sea. Their influence is rarely felt at the change of the monsoon from N.E. to S.W.; but at this period there are strong breezes or *nortades*. Hurricanes are only felt in September and October, at the change to the N.E. monsoon, when the northern islands of the archipelago are often devastated.

The Currents are modified by those of the China Sea, running to the S.W. for nine months, and to the N.E. for the other three months, following the monsoons, the S.W. setting about three-quarters of a mile an hour.

GUAM,* Guajan, or Guahan, is the southernmost and principal of the

* Guam is spelt in the *Atlas Historique* of Freycinet's Voyage, *Gwam*, the *w* being equivalent to the diphthong *ou*. Most of the words usually spelt with this, the Italian *u* or English *oo*, are thus written in the excellent map in question.

Marianas, inasmuch as it is the seat of government, and is also the largest of them. Besides this, it is the only one inhabited to any extent, the population in 1873 amounting to about 7,000. It is 29 miles in length, N.E. by N. and S.W. by S., and of irregular breadth, 10 miles where widest, narrowing in its centre to not more than 3 miles. Except on the N.E. side, where there is no landing, it is bordered throughout the greater part of its circuit with a chain of reefs, which are uncovered at times. Excellent old Dampier thus describes the island :— " At a distance it appears flat and uneven, but coming near it, you will find it stands shelving, and the East side, which is much the highest, is fenced with steep rocks, that oppose the violence of the sea, which continually rages against it, being driven by the constant trade wind, and on that side there is no anchoring (except for small vessels). The West side is pretty low, and full of small sandy bays, divided with as many rocky points. The soil of the island is reddish, dry, and indifferently fruitful. The fruits are chiefly rice, pine-apples, water-melons, musk-melons, oranges and limes, cocoa-nuts, and a sort of fruit called by us bread-fruit. The cocoa-nut trees grow by the sea on the western side in great groves, 3 or 4 miles in length, and 1 or 2 miles broad."

It was surveyed by M. Duperrey, under the orders of Captain Freycinet, in 1819. He went round it in a boat; and in the Atlas attached to the Voyage of *L'Uranie* are some excellent and detailed plans.

The North side of the island is rather low, the small hills of Santa Rosa, about 650 ft. high, being the only elevation, but to the southward it is more mountainous, Mount Tiniquio forming several peaks, of no great elevation.

Point Ajayan, the S.E. extremity of Guam, is in lat. $13^{\circ} 14' N.$, long. $144^{\circ} 44' E.$ To the West of it is *Ajayan* (Ahayan) Bay, singularly obstructed by reefs. The South end of Guam is an uninterrupted sandy beach fronted by reefs, having two or three small islands on it. *Cocos Island*, formerly called *Danéono*, and near to it *Bali Island*, lie $2\frac{1}{2}$ miles from the S.W. point of Guam. It is a mile long, low and barren, with some trees, among which was a single cocoa-nut tree, which gives its name. It is surrounded by reefs, which, extending to the northward, form between it and the actual S.W. point of Guam the small boat harbour of *Merizo*. The whole of this part of Guam should be cautiously approached.

The people at this part of Guam were much afflicted with leprosy. The town of *Merizo*, about $1\frac{1}{2}$ mile southward of Umata Bay, contained only 22 houses, and 146 lazy and dirty inhabitants, the only house that was habitable being that of the padre.

Santa Rosa Shoal lies to the S.S.W. of Guam. Admiral Krusenstern mentions it with some doubt as to its existence, but of this there is no question. Dampier saw it in 1686, on approaching the island. "They sailed over a rocky shoal, on which there was but 4 fathoms water, and abundance of fish swimming about the rocks." The Spanish galleon, too, arrived from Acapulco while

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he lay at Guam; but, avoiding Dampier's ships, sailed to the southward, and struck on this shoal, knocking off her rudder, and not getting clear till after three days' hard labour. It must be at a considerable distance off, for after some hours' sail, they sighted Guam, 8 leagues distant. On Cantova's chart it is made 20 leagues in extent, E.N.E. and W.S.W., and about half as broad. Its position may be about lat. 12° 30' N., long. 144° 15' E.

On Mr. Dalrymple's chart, a bank, discovered in 1740 by Galvez, is made to be 20 miles to the S.W. of Guam, in lat. 13°; but this has not since been found; an American vessel, among others, passed over the site in 1804, without finding bottom. This may be the same as that mentioned by Dampier, but it is probably not of the extent delineated by Cantova.

Umata Bay, 4 miles northward of Cocos Island, is about one-third of a mile deep, East and West, its entrance being 3 cables wide. It is perfectly sheltered between North and South, round by East; but in the season of westerly winds, or from June to September, it is imprudent, or perhaps impossible, to remain here, on account of the heavy sea sent in.

The South coast of the bay is mountainous from *Cape Chalan Aniti* to its head, where is the *River Umata* or *Saloupa*, the usual watering-place. The North coast is low, and the town stands here. The church, built at the foot of the mountain, fronts the eastern part of the bay; a small rivulet, the *Sabo River*, flows between the church and the Governor's house. Behind the town the hills rise in an amphitheatre, and are neither high nor remarkable. On the South side of the bay, on the contrary, *Inago Mount*, opposite the Governor's house, is remarkable; and farther West is another of 120 or 130 ft. high, on the summit of which is the fort of N. S. de la Soledad. Between these two hills flows a rivulet of excellent water, called the *Chioreto*.

Umata was destroyed by an earthquake on February 25th, 1849, as shown by stone inscriptions on the ruins of the Governor's house and the church; and in 1876 it was found to be a wretched place, with only 167 inhabitants. Although the fortifications still looked imposing *on paper*, they have not a single gun.

Point Tougouéne, the South entrance point of Umata Bay, is low, pointed, and guarded by a narrow chain of reefs extending nearly a cable westward of it. On the North point of the bay is an isolated and picturesque rock, on which *Fort Sant' Angel* is built, approached by steps cut in the rock. About a cable North of it is another, *Fort San José*. A ruined battery at the bottom of the bay opposite the church is called N. S. del Carmen. Forts San José and N. S. de la Soledad are plainly discernible by their whiteness.

The anchorage is in 7½ fathoms, sand and shells, with *Fort Sant' Angel* bearing N.E. by N. ½ N., and *Fort N. S. de Soledad* S.E. by E. ½ E., in the mouth of the bay.

From Umata Bay the coast trends N.W. by N. ½ N., 3 miles, to *Point Faepi*, in lat. 13° 19' 50" N., long. 144° 37' E., forming several sinuosities in the space,

the deepest of which is *Cetti Bay*, as large as that of *Umata*. *Point Facpi* is remarkable for being pointed, projecting, and terminating in an isolated rock, joined to the shore by a breaking reef, uncovered at low water. Thence to *Point Oroti*, the West point of the peninsula of the same name, the coast presents a bay of 6 miles opening and 2 miles deep, in which are several coves and islets. The town of *Agat*, with about 650 inhabitants, is at the bottom of this bay, and off it there is good anchorage in N.E. winds, but the landing is difficult on account of the reefs. The land appears to be very fertile and pleasant.

Agat is now one of the most important places next to *Agaña*. It contained 36 native houses, a poor church, and a stone house for the padre. To the S.W. of *Agat*, 2 miles distant, is *Aloupan* or *Alutung Island*, at the West extremity of a reef stretching two-thirds of a mile off *Point Baugne*. From *Agat* to *Oroté Point* the distance is $3\frac{1}{2}$ miles to N.W. The S.W. face of the *Oroté Peninsula* is formed by a cliff, apparently steep-to. The whole of this peninsula is madreporic, and cannot be traversed, on account of the prodigious number of rocks and precipices which cover it.

PORT SAN LUIS D'APRA.—From *Point Oroté*, near which is a small island, the coast trends first E. by S., then S.E. by S., to the village of *Apra*, built on the isthmus, with a rude landing-place; thence it turns to the East and North, thus forming a large indentation nearly in the shape of a V, the opening of which is nearly closed by a long and narrow coral island, named *Cabras* or *Apapa*, and numerous reefs. The bay is very extensive and safe, but has a great many banks, coral rocks, and islets, especially in the S.E. part. The entrance is contracted by the continuation of *Cabras Island* in the form of a line of reefs, the *Luminan Reefs*, and the *Tirado* or *Catalan Banks*, which come within about one-third of a mile of *Oroté Island*, leaving a deep channel, the usual entrance. In 1873, the entrance was stated to be only 2 cables wide, *Catalan Bank* having extended to the southward.

The distance between *Apapa Island* and *Cape Oroté* is $2\frac{1}{2}$ miles in a W.S.W. direction; but *Luminan Reefs*, extending $1\frac{1}{2}$ mile westward of *Apapa Island*, contract the passage to one-half the width, which, besides this, is made still more difficult by *Catalan Bank* lying precisely in the middle of the passage. But as there is a good passage on either side of this shoal, half a mile in breadth, this entrance would be scarcely dangerous, if care be taken to mark its two extremities with buoys or flags. The depth in the passage to the N.E. of the bank not being more than $5\frac{1}{2}$ fathoms, coral bottom, Captain Kotzebue advises ships to pass by the channel S.W. of the bank, and to keep as close as possible on the *Oroté* side, where the depth of water is sufficient for the largest ships. After passing beyond the bank a basin is entered, where anchorage may be taken if circumstances demand it; but, as the water in it is of a very great depth, and the bottom is bad, it would be better, if the wind and tides allow, to keep on the course to the inner part of the harbour, where you may

anchor at the distance of a quarter of a mile off the small island of Santa Cruz, in 15 fathoms. At the period of Kotzebue's visit, in 1817, there was a battery of three six-pounders on this island.

In the centre of the basin is a rock level with the water, on which *Fort Santa Cruz* is built, in lat. $13^{\circ} 25' 45.3''$ N., long. $144^{\circ} 39' 45''$ E. The usual anchorage is about 2 cables to the North of this, in a basin of 4 to 15 fathoms, mud, surrounded by coral patches 2 or 3 ft. beneath the surface. The channels leading to it are frequently narrow, the last before entering being not more than 120 yards wide. The patches are very steep-to, and may be approached almost to touching. The best anchorage is in 22 fathoms, coral sand, with the West end of Cabras Island bearing N.E., and Fort Santa Cruz S.E. $\frac{1}{2}$ S. The tide rises from 3 to $4\frac{1}{2}$ ft. Outside the harbour the current sets constantly to the westward.

Landing is very inconvenient, the shore being everywhere fringed with coral reefs. The best landing, if wishing to proceed to Agaña, is at Punto Piti opposite Cabras Island, about $1\frac{1}{2}$ mile from the anchorage; the point is white-washed, and there is a small pier.

From the entrance of the port to the Island of Santa Cruz the distance is 2 miles; it would perhaps be dangerous to attempt to beat in or out against a contrary wind, as Kotzebue did; it would be more prudent to wait for the West wind, which springs up every morning at daybreak, and to tow through the narrowest part of the passage. A small river falls into the harbour at three-quarters of a mile eastward of Santa Cruz Island, and this is the watering place; but the boats ought to be sent at high water, because at other times it would be difficult to reach the mouth of the river. The casks are filled at low water, and you wait for high water to get off again. At *Sumaye*, westward of Santa Cruz Island, some beef, fowls, eggs, and vegetables may be obtained.

The port dues amount from half a dollar on Spanish vessels of less than 10 tons to $5\frac{1}{2}$ dollars on vessels of 750 tons and over. Foreign vessels pay double these rates.

The shores of the Bay of Apra were depopulated, and the villages of *Apra* at the head of the bay, of *Ajayan* in the South part of the island, *Tarafafo* on the East coast, and *Ilie* near to it, disappeared during the epidemic of 1859. There was only one medico in the whole archipelago, and the small-pox ran its course, and in many cases left not a single survivor.

Soumaye, on the West side of the beach at Apra Harbour, is the place chiefly resorted to by the vessels lying here. It had 29 decent houses, and the people are more obliging here than elsewhere. It is due West of Fort Santa Cruz.

From San Luis the coast runs to the E.N.E., and then North, $1\frac{1}{2}$ mile, to *Point Acahi-Fanahi*, a perpendicular rock, near which lies the small island of *Ganan*. The reefs from Apra Island reach to the latter. At $1\frac{1}{2}$ mile from Point Acahi-Fanahi is *Point Adeloup*, better known to the inhabitants as

Punta del Diablo, on account of the extreme rapidity of the current*, which make it very difficult to be doubled. A sandy beach commences immediately after Point del Diablo, which trends to the East and North, forming the *Bay of Agana*, in the middle of which is the harbour and town of Agaña, the capital of the archipelago. *Aloupán* or *Alutung Island* forms the N.E. extremity of this bay; it nearly touches *Point Apurguan* or *Apuequan*, and makes apparently a secure anchorage, but it is too shallow except for small boats.

AGANA contains the principal part of the inhabitants of the Marianas, and bears the lofty title of the *City of S. Ignacio de Agana*, but it is a small town of about 3,500 inhabitants. The greater part of the houses are but poor Indian cabins, thatched with cocoa-nut leaves, but there are a few stone houses for the better classes. The chief buildings are the Governor's house, the arsenal, barracks, the church, and the college. The last was founded in 1673, the first establishment in the archipelago. There is a convict establishment here. The streets are wide, clean, and regular. A small but clear stream traverses the city, and is crossed by two stone bridges, and the appearance of the place, with its rich vegetation, is pleasant, but the population is lifeless and apathetic. A large portion of the half-breed Indians are copper-coloured, with extremely light hair,—a feature which has arisen from the intercourse of the American and English whalers. Prior to the opening of the Japanese ports they frequently came here; their visits are now rare. Only poultry and vegetables can be obtained.

The town is built on the sea-shore, but in a most inconvenient position, and the landing is obstructed by breaking reefs. There is not even anchorage before it, for the coral bottom renders a stay impossible, and to be off and on is attended with much hazard. This is the only mode of calling here, unless, which is better, the vessel proceeds to San Luis de Apra, for which a pilot may be obtained here.* There is a good road between the two places, the only one on the island, but the distance, a league, is too far to walk in this climate.

The coast from Apuequan Point to *Point Tumun* is of steep rocks, and all the detached points hence to the northward of the island are absolutely alike. At $2\frac{1}{2}$ miles to the N.E. of Point Tumun is *Point de los Amantes*, *Tumun Bay* lying between. This bay appears to be filled with reefs, but there are several passages through it, where boats can reach the shore without difficulty. Near the middle of the bay, and to the South of the village of *Gnaton*, a cross was erected to the memory of Padre Sanvitores, the martyr of the

* An instance of the dangerous nature of Agana Bay was afforded by the wreck of the British ship *Invincible*, January 5, 1866. She came in without a pilot, and insisted on leaving next day. With some assistance she got out, but was immediately dashed to pieces on the rocks to the West of the entrance; the crew were saved with difficulty.

Marianas, who was killed on this point by a native chief, while he was baptizing a child.

From Point de los Amantes to *Point Nigo* the coast trends N.N.E.; it is barren and uninhabited. Southward of this latter point is the exposed anchorage of *Falcone*.

Point Ritidian, the N.W. point of Guam, is in lat. $12^{\circ} 38' 54''$ N., long. $144^{\circ} 51' 58''$ E. A short distance inland the perpendicular hills form, scarcely without interruption, the circuit of the island on the East side. The coral reefs trend to the S.E. from Point Ritidian to *Point Tagua*, forming the shore. From this the land trends East a mile to *Point Patay*, the N.E. point of the island.

The eastern coast of the island, as far as Tarafofo Harbour, offers no shelter to the navigator, and ought, therefore, to be avoided during the eastern monsoon. The only openings are *Pago Harbour*, in lat. $13^{\circ} 24'$, accessible only for boats, and *Ilic Bay*, 2 miles to the southward, and equally unimportant.

Port Tarafofo, $4\frac{1}{2}$ miles South of Ilic Bay, is the only harbour, next to San Luis, which will receive vessels at all seasons of the year. There are no rocks in it, nor is there any danger. It is formed of two small, deep bays, the northern of which, Tarafofo, is open to the East, in which direction it is half a mile long, and about $1\frac{1}{2}$ cable wide. The other, on the South side of the entrance, is smaller, and is called *Paicpouc Cove*. *Tarafofo River*, the most considerable in Guam, enters the head of the bay. Madreporic hills, very steep, descend on both sides of the harbour to the water. That of Mahilouc, on the North side, is celebrated in the history of the country. A point at the head of the bay, on the South end of the sandy beach, is in lat. $13^{\circ} 18' 9''$ N., long. $144^{\circ} 46' 14''$ E. There was no village in the vicinity.

From Tarafofo to *Ulonnia* or *Hounlodgna Bay*, $1\frac{1}{2}$ mile to the S.W., the land is low, with sandy beaches and rocky points. The bay is only fit for boats. *Ynarajan Bay*, a mile farther to the S.W., is a quarter of a mile wide in the opening, and half a mile deep, but reefs fringing the shore considerably contract the anchorage. It is open from East to South, and during westerly winds a vessel would be perfectly safe in it, but not with the opposite. The village of Ynarajan is on the S.W. side; in 1875 it had 276 inhabitants, a church, and house for the priest. At the head of the bay are several streams. Point Goal, on the North side of the entrance, is in lat. $13^{\circ} 16' 30''$ N., long. $144^{\circ} 45' 18''$ E.

Ajayan Bay, three-quarters of a mile S.W. of Ynarajan, is smaller than the latter. It may have good anchorage for vessels of less than 15 ft. draught. It is open to E.N.E.; and at its head is a small brook, where boats can readily procure water. *Ajayan Point*, the S.E. point of Guam, has been before mentioned.

ROTA ISLAND (*Zarpane* or *Sarpan*), called *Luta* by the present inhabitants, lies N.E. by N. $\frac{1}{2}$ N., 30 miles, from the North end of Guam, the channel

between being clear of known dangers. It is 12 miles long, N.E. by E. and S.W. by W., and $5\frac{1}{2}$ miles in breadth, and nearly surrounded by reefs. It is hilly in its East and North portions, particularly so in the centre, where it is about 800 ft. high, but it becomes lower, in the form of an amphitheatre, to the S.W., to a low and sandy isthmus, where the villages of *Sosanlago* or *Sossan Hagno* and *Sosanjaya* or *Sossan Haya* are built. To the S.W. of this isthmus is the S.W. point, called *Taipongon Point*, a hill terminating in a level and very regular plateau.

The S.E. side of the island is tolerably high and perpendicular on the seashore, presenting thus a straight wall, and at its angles vertical fissures like the embrasures of a fort. In other parts the land descends gradually to the sea, terminating in long and low points. Its N.W. coast and the S.E. side of the isthmus are bestrewed with numerous rocks, on which the sea breaks, more or less, according to the direction of the wind. The portion of the island not inhabited is so encumbered with bushes (on the North side only are some coconut trees) that it is difficult to penetrate.

Three wells furnish water to the people; two of them are artificial, and the water is detestable; the third, which is natural, affords better, though it is brackish. On the East coast, at 5 miles from the villages, there is a rivulet of very good water. There are some cattle and pigs on the island.

Captain Sanchez y Zayas gives the following remarks on Rota:—

The two villages are more properly two streets which, collectively, are called *Rota*. They consist of seventy-nine huts of leaves and bamboos, a small hermitage called a church, a house for the padre, and a sort of hovel which they call the royal house. The priest is the only European, and there were 335 inhabitants. There is anchorage opposite to either village. The streets are built on the sandy isthmus, which is so low that the sea threatens to break over it in bad weather, when the people take refuge in a cavern near *Sosanjaya*. This cavern is exceedingly curious, abounding in crystals, and of unknown but great extent. It is stated that there is an extinct crater on the summit of the island, but it must be of great antiquity, for the trees cover it luxuriantly. On the flanks of the mountain there are scattered a great number of ancient stone monuments, apparently sepulchral, and belonging to an age anterior to the Chamorros or last inhabitants.

The anchorage of *Sosanlago*, to the N.W. of the sandy isthmus, is very bad. There is but a small space for anchorage on the reef, and the bottom is rocky, besides which the depth is most uneven. The *Narvaez* was quite brought up to shoal water, and the anchor dropped in a hole 30 fathoms deep. The ground all around the island is of coral, which will explain this, and the channel through requires a pilot.

The roadstead of *Sosanjaya*, on the opposite side of the isthmus, is almost as bad as the other, with this distinction, that here the coast is rocky, and there is no landing. Although the *Narvaez* was here protected from the N.E.

wind and swell, yet, to land, the boats had to pull around Point Taipington for 3 miles to get to the village. Capt. Sanchez y Zayas thinks that it is the worst in the Marianas.

The only refreshments to be got here are poultry, bananas, and oranges, which the people will exchange for useful things, such as clothes, nails, or utensils, in preference to money. Water is scarce, bad, and difficult to embark.*

Aguijan, or *Agrigan*.—At 44 miles N.N.E. of Rota is the small island of Aguijan, not more than 3 miles long, and 2 miles wide. In its North part are high, perpendicular, and nearly naked rocks, their summits crowned with a thick wood. At a distance this island appears parched and barren, but this is not so when closer. At about three-quarters of a mile to the S.W. of Aguijan there are three rocks, small and perpendicular, between which and the island there is a passage for the largest ship. The island is uninhabited. It is said that the inhabitants of Tinian formerly carried some goats to Aguijan; they may have multiplied greatly, for it is but little frequented. The only points fit for landing are on the West and N.W. sides, in some very small creeks, lined with sandy beaches. Its centre is in lat. $14^{\circ} 53' 30''$, long. $145^{\circ} 30' E$.

TINIAN, or *Bona Vista*, is separated from Aguijan by a channel 5 miles broad. It has been celebrated for its fertility and the prodigious quantity of cattle; in 1876 it contained about 200 inhabitants. It is 10 miles in extent, North and South, and $4\frac{1}{2}$ miles broad. *Sunharon* or *Anson Road*, on the S.W. side of the island, being open, and the bottom very bad, cannot be recommended as an anchorage, particularly between the months of June and October; at other times it is secure. Lord Anson anchored here, August 27, 1742, in 22 fathoms, on a bottom of hard sand and coral, about $1\frac{1}{2}$ mile off shore; at this position the two extremes of the island bore N.W. $\frac{1}{2}$ N. and S.E. $\frac{1}{2}$ E.; the centre of Aguijan Island, S.S.W.; the peak of Saypan Island was visible over the island of Tinian, N.E. by N. $\frac{1}{2}$ N.; and a reef of rocks lying between the vessel and the shore, E. by S. $\frac{1}{2}$ S.

The first account of the Mariana Archipelago that deserves the attention of navigators is that given by Richard Walter, the chaplain to Commodore Anson, in his voyage round the world, who came to Tinian as just stated, and remained till the end of October, 1742. Frightful ravages had been made by scurvy in the ill-fated crew of the *Centurion*, in a previous part of her voyage. They arrived here in their floating hospital, and by means of the refreshments spontaneously produced, they all recovered in a week. Walter draws the picture

* *Kimball Islands*.—In 1842, Captain Kimball reported (in the *San Francisco Herald*) that he had seen a group of small islands in $14^{\circ} 25' N.$, long. $149^{\circ} 10' E.$, or 200 miles eastward of Rota. Nothing more is known of them, and they may be placed as very doubtful.

of Tinian in the most glowing colours. The healthy and dry soil, the beauty of its natural meadows, the diversified woods and lawns, valleys and hills, abounding with herds of thousands of cattle; guanacoës, wild hogs, exceedingly fierce, but excellent meat; wild fowls, too, in every part; its fruits, guavas, coconuts in considerable numbers, limes, oranges, and "a kind of fruit peculiar to these islands, called by the Indians *rhymay*, but by us bread-fruit," swell into a long list of luxuries to the declining mariners. The fish that were taken proved obnoxious; Walter supposes from the men eating too much, but Byron afterwards proved that it really was of deleterious quality. The island had no rivulets or running water, but springs were everywhere met with, "and in the midst of the island there are two or three considerable pieces of excellent water." The accounts of Anson's stay, and what they saw in Tinian, led to very great expectation in the succeeding visitors.

When Byron came here, twenty-two years after Anson, he found Tinian a very different place to what it had been described. Instead of a paradise, it was, in almost all respects, the reverse. The climate was insufferably hot, the water scarce and bad, and the plague of fleas intolerable. Walter, it is true, mentions the last drawback; but Byron says they were covered with them from head to foot, nor could they open their mouths without getting them filled. Added to this, it was found more unhealthy than almost any other place that they had visited. The two accounts of 1742, and Byron's in 1763, could scarcely be more opposite. Wallis, who came here in 1767, draws a picture scarcely more flattering than the latter. Capt. Gilbert, who passed it in 1788, says that Capt. Wallis's account seemed to be nearest to its condition at that time; so that we may suppose that Lord Byron's picture is somewhat overdrawn, as that of Walter's undoubtedly is. Lieut. Mortimer, who came here in 1789, in the *Mercury*, got all they required, but the cattle were very wild and shy. The well near the anchorage, so much praised by Richard Walter, and so dispraised by Byron as being brackish and full of worms, was found to be good and sweet; but this may have been the effect of season. Lieutenant Mortimer was here in December, Commodore Byron in August; Capt. Gilbert found it dry in August, 1788.

On one point all agree, that is, the badness of the roadstead; we therefore quote Richard Walter's words:—"But the most important and formidable exception to the place remains still to be told; this is, the inconvenience of the road, and the little security there is, in some seasons, for a ship to anchor. The only proper anchorage place for ships of burthen is at the S.W. end of the island; the Peak of Saypan, seen over the northern part of Saypan, and bearing N.N.E. $\frac{1}{2}$ E., is a direction for readily finding it; the anchoring place is then 8 miles distant. Here the *Centurion* anchored in 22 fathoms, about $1\frac{1}{2}$ mile off the shore, opposite to a sandy bay. The bottom of this road is full of sharp pointed coral rocks, which, during four months of the year, that is, from the middle of June to the middle of October, render it very unsafe anchorage.

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This is the season of the western monsoons; when near the full and change of the moon, but more particularly at the change, the wind is usually variable all round the compass, and seldom fails to blow with such fury that the stoutest cables are not to be confided in. What adds to the danger at these times is the excessive rapidity of the tide of flood, which sets to the S.E., between this island and that of Aguijan. This tide runs at first with a vast head and overfall of water, occasioning such a hollow and overgrown sea as is scarcely to be conceived, so that we were under the dreadful apprehension of being pooped by it, though we were in a 60-gun ship. In the remaining eight months of the year, that is, from the middle of October to the middle of June, there is a constant season of settled weather; when, if the cables are but well armed, there is scarcely any danger of their being ever rubbed. I shall only add that the anchoring bank is very shelving, and stretches along the S.W. end of the island, and is entirely free from shoals, except a reef of rocks, which is visible, and lies about half a mile from the shore, affording a narrow passage into a small bay, which is the only place where boats can possibly land."—(Anson's Voyage, book iii., chap. 2.)

We have been more discursive on Tinian than its merits perhaps deserve, but as it is a point familiar in the history of navigation, it has more interest than it would otherwise claim. The position of the village of *Sunharon*, abreast of Anson Road, is lat. $14^{\circ} 59' 22''$ N., long. $145^{\circ} 36' 20''$ E.

Capt. Sanchez y Zayas says that Tinian is very low, and has no hills of any kind. But pumice-stone, black sand and scoriae, which are found everywhere on it, give certain indications of its volcanic origin. All the western side, except *Sunharon*, is perpendicular, and may be passed close-to, especially at *Point Gurguan*, the S.W. end of which he nearly touched in the *Narvaez*, but still it would be better to give it a berth of half a mile, as the shores are not perfectly known.

In the N.W. part there is a reef which runs off a short distance, and off the eastern side, which is even more perpendicular, and more weather-beaten than the western coast. It is said that a reef extends eastward from *Point Lalo*, the South extremity.

The village of *Sunharon* consisted, at the time of the visit of the *Narvaez*, of fifteen huts, inhabited by 15 people, who were sent here from *Agaña*, and changed every two years, for the purpose of slaughtering the cattle and drying the flesh, making what is called *tajea* or *tasajo* (jerked beef), which is sold for the benefit of the Lepers' hospital, and forms one of the small sources of revenue possessed by the islands. At a short distance from the village, on the East coast, is the hospital for incurable lepers, of which there were only three in 1865, creatures condemned without mercy by the Spaniards, but they are cared for by the Indians. The antiquities which are found on Tinian have been before alluded to.

Sunharon is the only point where a vessel can anchor or a boat can land.

The *Narvaez* anchored here for five hours in the best spot she could find, and with every caution, but she broke her anchor. This will indicate the worth of the anchorage.

SAIPAN or *Seypan Island*, which is distinguished by a lofty peak, is so close to Tinian that small boats pass from one to the other over the shoal water. This island is fertile, wooded, and about 14 miles long, N.N.E. and S.S.W.* The volcanic cone is of a perfect form, but its elevation has been much exaggerated. Capt. Sanchez y Zayas believes that it is not more than 1,000 to 1,200 ft., but it was not measured. It has been given at double this. At about 2 or 3 miles North of this peak there is another extinct crater, moderately elevated. The southern part of the island is flatter, forming an extensive grazing ground. The beach is bordered by trees, among which the cocoa-nut palm is conspicuous.

Formerly the island must have been populous, judging from the numerous tombs which are met with, and there are still some caves filled with skulls, which were the objects of veneration before the arrival of the Spaniards, by whom it was entirely depopulated. In 1810, the Americans founded a trading post for the whalers, but they were driven away in 1815. About 1842, some natives of the Carolines, whose island had been submerged, obtained permission to settle here, and they founded the village of Garapan on the East coast, which in 1876 had about 700 inhabitants. These people have cleared the greater part of the island, and have it well under cultivation; the men are also good sailors and pilots. There are also some convicts and a Spanish guard of about 50 men.

The direction of the western coast of Saipan, beyond the South point, is first N.W., then it turns to the North. It is skirted by coral reefs, extending from 1 to 1½ mile from the shore, and has an arm stretching to the S.W., near the end of which is *Managasa Island*, about 2½ miles N.N.W. from the N.W. point of Saypan.

Garapan, in lat. 15° 12' 11" N., long. 145° 40' 30" E., may be recognised from sea at some miles distance by a large white rock on the shore, resembling a white patch on the dark green of the vegetation. When this bears between North and East you may steer for it, but it must on no account be brought to the South of East, or between East and South. *Mañagasa Island* will be left to port, guarding against the reef off it, and you may anchor with the flagstaff at the village to the North of East, in 10 to 15 fathoms. Care must be taken not to bring the flagstaff to bear East, because this leads on to

* Capt. Sanchez y Zayas found that the charts of Saypan were very defective, and that many of the names were misplaced. A long reef was shown as running out from the North part of the island, and terminating about 8 miles from its southern point, and on this reef is placed *Managasa* and two other small islets. Nothing of this kind exists. The chart he has improved is not quite correct, but is better than that previously given.

the *Tortuga Bank*, which is extremely dangerous, and nearly awash, the sea but rarely breaking on it. To the North of this bank is a series of other shoals, separated by small channels, which unites with those of Mañagasa Island.

There is anchorage also about a mile outside the reefs in 19 fathoms, to 7 or 8 fathoms close to them, coral bottom, bringing the most conspicuous of the houses about E.N.E., and Mañagasa Island to North or N. by E. The bottom is generally rocky and coral, but with some sandy spots. The *Narvaez* anchored in 14 fathoms, rock and sand, with the West point of Mañagasa N. by E.; the East point N. 14° E.; Saypan N.W. point N. 35° E.; the largest house in Garapan N. 68° E.; the N.E. point of Tinian S. 14° W.; and the N.W. point S. 24° W.

During the period of the N.E. trades this anchorage is safe, but during the season when the S.W. monsoon may reach the Marianas, a vessel would be in great danger here, should she be overtaken with even moderately bad weather.

There is a boat channel across the reefs to the village; it is wide enough, and is beacons by the natives with trunks of trees. This channel can be used by day by attending to these marks, but not by night without a competent guide, as the channel is very crooked.

Tanapag is a spacious harbour between the N.W. shore of Saypan and Mañagasa Island. The entrance is difficult, especially for a sailing vessel, with N.E. winds, the narrow channel being bestrewn with rocky heads, but when within there is a well-sheltered and safe anchorage. The Spanish corvette did not remain long enough to make a plan of it, but from what was learned respecting it, it was concluded that this harbour, and that of San Luis d'Apra, were the only ones in the Marianas, where a vessel of any size could heave down and careen. A whaler of considerable draught had done so in Tanapag.

Magicienne Bay, so named by Capt. N. Vansittart, R.N., C.B., in command of the steam-frigate of that name, in July, 1858, is on the S.W. side of Saypan; lat. 15° 8' 30", long. 145° 44'. Capt. Sanchez y Zayas says that it is not better than any other part of the coast where there are regular soundings. It is probably safe with S.W. winds (August and September), but it would be better to go to Tanapag. During the rest of the year it would be impossible to remain here on account of the heavy sea. The *Magicienne*, from Hawaii to Hong Kong, being short of fuel, came here to cut wood.

Mr. Harvey, the master of the steam-frigate, says:—

"This bay cannot be recommended to a sailing vessel, as the water is deep, and the anchorage so close to a coral reef bordering its shore, that with a southerly wind there would be no room to weigh. The depth is 30 fathoms, over coral with sandy patches, at only a third of a mile from the bluff at the head of the bay, decreasing rapidly to 3 fathoms close alongside the coral reef, which nearly dries at low water. The *Magicienne* anchored in 18 fathoms, with the S.W. point of the bay bearing S. $\frac{1}{2}$ E., about 2 $\frac{1}{2}$ miles; the S.E. point, which is a bluff, E.S.E., 1 $\frac{1}{2}$ mile; and a wooded bluff at the head of the

bay, N.N.W. $\frac{1}{2}$ W., nearly a third of a mile. When the vessel swung to the shore there was 9 fathoms, coral patches, under her stern, and she was distant only a cable's length from the reef; at a cable's length to the southward of her anchor there was no bottom at 70 fathoms. The bay is well protected, being open only from E.S.E. to South.

"*Supplies.*—There is a plentiful supply of wood growing on the shores of Magicienne Bay, being for the most part the thickness of a man's body, white when cut, and in substance something between a bad ash and a poplar. The best place for landing is on the sandy beach to the eastward of the wooded bluff at the head of the bay. The crew of the *Magicienne* cut down and brought on board 172 fathoms in six days, the wood growing close to the beach, and easily carried to the boats, which could lie afloat close to the coral reef. The wood being free of resinous substances, it did not give out so much heat as might have been expected; $3\frac{1}{2}$ fathoms of it being only equal to 1 ton of good Welsh coal. No water could be obtained; wells were dug, but the water from them was brackish; indeed, there appears to be no water on the island except what is caught during the rains, and the rainy season in August, September, and October. Cocon-nuts, bread-fruit, and limes are plentiful. There are also many wild pigs and bullocks; the latter belong to the Spanish government. Pigs, poultry, and fruit, can be obtained at the village.

"The few days the *Magicienne* remained in this bay the wind was light from the S.E. during the day, and at night a light air from the land between N.E. and N.W.

"It is high water, on full and change, in Magicienne Bay, at 6^h 45^m; the tide rises about $2\frac{1}{2}$ feet."

"*Winds.*—In January, February, and March, winds from N.E. to North prevail, with violent rain squalls (*churadas*), veering in April to East and E.S.E., with moderate weather when the wind hauls to the South of East. In May, June, and July, the prevailing winds are from South and S.W., with good weather and less rain, although it is still abundant. From August to November it blows mostly from the West, with heavy rain interrupted by violent storms, the last two months being the hurricane season. In December the wind veers through N.W. to North and N.E.

FARALLON DE MEDINILLA, or *Bird Island*, about 41 miles N.N.E. of Saypan, is only 2 miles long, N.E. and S.W., its breadth being much less. It is a calcareous rock, about 50 ft. high, flat, with perpendicular sides. It is barren, and has reddish patches, and on the South and West sides are some very deep caverns or grottos. M. Duperrey says that the South point is terminated by a small hill, *perhaps* joined to the island by a low isthmus. At its South part is a pierced rock, through which a boat might pass. Freycinet called it *Pointe des Grottes*, and the island itself after the respectable governor of Guam.

Capt. Sanchez y Zayas, who examined this island carefully, could trace no

resemblance between its form and the French plan.* Either the figure of the island has changed considerably, or else the plan is drawn from imagination; the low neck and hummock could not be recognised; all appeared of the same elevation.

The Governor of the Marianas stated that there existed vestiges of a crater on its summit. It is undoubtedly of volcanic origin, and is quite bare of vegetation, the sea washing completely over it in heavy weather. Its centre is in lat. $15^{\circ} 59' 20''$ N., long. $146^{\circ} 0'$ E.

ANATAXAN or **Anatajan Island**, 27 miles N.W. of the last, is about 5 miles long, East and West, and over $1\frac{1}{2}$ mile wide. It has two very high and steep volcanic peaks lying on the same parallel. To the S.W. only there is a small point slightly projecting.

It was seen by the *Narvaez* 40 miles off, although the weather was not very clear. It is very steep to all around. In the southern part only is a sort of creek, in which, however, the water is so deep that a vessel could not anchor. Three peaks are seen from this part, one of which, it is said, is a volcano. Perhaps a closer examination might discover a boat or other landing, because the island was inhabited at the time of the Spanish discovery. It is covered with trees and bushes, among which the cocoa-nut is conspicuous. Lat. of the centre, $16^{\circ} 20'$ N., long. $145^{\circ} 40'$ E.

SARIGUAN ISLAND, 18 miles to the N.N.E. of the preceding, appears to be merely a high hill, of the form of an upright cone, with a nearly circular base, $1\frac{1}{2}$ mile in diameter. Its summit is rounded, and seems to be of volcanic origin. It was formerly inhabited, but is now completely deserted. Freycinet says that it is almost without vegetation. Sanchez y Zayas says that it is covered with trees; lat. $16^{\circ} 41'$ N., long. $145^{\circ} 47'$ E.

FARALLON DE TORRES or **Zealandia Rocks**.—The first of these names is given from a former Governor of the Marianas, who gave a note of their position to all commanders who arrived at Guam. The second is that of the vessel commanded by Capt. J. Foster, who drew attention to their existence in 1859. Their previous omission from the charts led to a series of very remarkable errors, as stated in the note below.†

* The captain of the *Narvaez* adds that all the northern islands of the archipelago were very badly represented; and, as will be mentioned presently, the chart was manifestly very hurriedly drawn up.

† These rocks were shown as two points to the S.W. of Guguan (but without name) on Espinosa's chart of 1812. They were passed unnoticed in the *Uranie* by Freycinet, in 1819, and that commander, being possessed of a correct list of the islands in their proper order, applied the name *Piedras de Torres* to the island of Guguan to the North of it, then transposing all the correct names up to Agrigan, which he called *Asuncion*, placed *Pagon* at 3 leagues to the North of the island properly so called, but which he called *Alamagan*. This supposed island, which they thought they saw imperfectly through the haze, has no existence, and thus this imaginary island, coupled with the omission of the *Piedras*

The name *Farallon* is perhaps scarcely applicable to them. They are not pinnacled rocks above water, and therefore *Piedras de Torres*, the *Torres Rocks*, best describes them. It may be that the heavy sea constantly beating on them has reduced the height of these evidently volcanic peaks, since their first announcement. They were not seen by the *Narraez*, but they were described by the shipwrecked people they had on board, and especially by Salas, a pilot, as consisting of *three* rocks awash, each about as large as a boat, occupying a space about a cable's length, more or less, in extent. There is no appearance of soundings near them, and in fine weather the sea only breaks at long intervals. Their position, as stated, accords with that given by Captain Foster.

The *Zealandia*, under the command of the above officer, from New Zealand to Shanghai, was passing between Guguan and Sariguan on December 31, 1858, supposing the channel to be quite clear and safe, as shown by the charts. He says:—"At 4 p.m. Sariguan Island bearing S.S.W., distant 12 miles; wind light from the eastward; ship steering W.N.W. about 4 knots; breakers were reported right ahead; saw two large patches about three-quarters of a mile from the ship; altered course to pass about half a mile northward of them, keeping a good look-out from the top-sail yard. At 4.20 p.m. Sariguan Island bore S. by W. $\frac{1}{2}$ W., distant about 11 or 12 miles, and the breakers in one with the island, distant from the ship about half a mile. The two patches bore from each other N. by E. and S. by W., about a quarter of a mile apart, with dark water between and all around them; the sea broke at times heavily."

The weather was threatening, and the day closing, so that Capt. Foster did not think it prudent to make a closer examination of them, but his careful observations place them in about lat. $16^{\circ} 51' N.$, long. $145^{\circ} 50' E.$

GUGUAN, a small island about 36 miles northward of Sariguan, is $2\frac{1}{2}$ miles long, N.N.E. and S.S.W. Its breadth does not much exceed a mile, and it is of moderate height, much resembling the *Farallon de Medinilla*. Its North point

de Torres, well known to the natives to exist to the South of Guguan, has led to the confusion above alluded to. This error was common to all charts after the publication of Duperrey's chart of 1819 until 1866, when Capt. Sanchez y Zayas' chart was published by the Spanish Government from the observations made in the *Narraez*, in 1864 and 1865.

Captain Sanchez y Zayas devotes several pages to the discussion of this important error, and to his passage between these islands.—(See *Ann. Hyd.*, No. 416, pp. 240—250.)

He took from Agrigan and Pagan fifteen persons who were nearly lost on the reef in question in August, 1863, and the launch was afterwards wrecked on Pagan. The rectification thus made by the Spanish commander was complete, but as the origin of the mistake is so manifest it does not require many words to explain it. In the ensuing descriptions of these otherwise unimportant islands, they will be noticed under their proper names. It may suffice here to say that *Guguan* was erroneously called *Farallon de Torres*; *Alamagan* was called *Guguan*; *Pagan* was called *Agrigan*, an imaginary island being substituted for Pagan. Besides this another imaginary group, the *Manga Isleta*, were supposed to have been seen in the *Uranie*, but do not exist.

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is the lowest; it is covered with vegetation, is perpendicular, and unapproach-
able on all sides. Freycinet gives its position, lat. 17° 16' 50" N., long.
145° 50' 15" E.

ALAMAGAN is almost exactly North of Guguan, at 16½ miles distant from
it. It is 2½ miles long, North and South, 1½ mile wide, and is one of the highest
in the archipelago. On it are two peaks, as seen from the West, the northern
one being estimated to be 2,316 ft. high; to the South and East the slope of
the hills is extremely rapid, and the rock, which descends to the sea, is com-
posed of bare lava. At its South end there are, however, some white and red
spots, and to the West a point covered with trees. The North side is not so
steep as the South. The highest point on the North side is a vast crater, from
whence Freycinet saw smoke issue, as was also the case with another to the
N.W., at two-thirds up the mountain. Lat. 17° 34' N., long. 145° 51' E.

PAGAN, or *Pagon*, about 25 miles North of Alamagan, was imperfectly seen
by Freycinet. Capt. Sanchez y Zayas says that it is about 8 miles long, N.E.
and S.W., and 2½ miles broad. At a distance it makes as two or three islands,
because its two ends are mountainous, and are connected by a deep valley.
There are *three* active volcanoes on it; one of which is to the N.E., the others
to the S.W., the highest peaks being from 800 to 1,000 ft. in height. The first
is a conical mountain, from which there issued dense columns of smoke when
the *Narvaez* passed, on January 5th, 1865. The two others to the S.W. are
open craters on the large hill, in which the island terminates at this end. One
of them is enormous, and flames issued from the other. The valley between
the hills is covered with black sand and innumerable bushes. The tropical
vegetation reaches nearly to the summit of the mountains, except the N.E.
cone, which is quite bare.

There is very little water on the island, but pigs and game may be got in
abundance. The *Narvaez* anchored off the N.W. side, about the middle; the
spot may be known by a large rock, which at 6 or 7 miles off seems to be like
an islet. At 3 or 4 cables off this is bad anchorage in 14 fathoms, bottom of
coral rocks. Landing is very difficult here, but about a mile to the N.E. of
this rock there is a low sandy beach, which has probably better anchorage and
easier landing. This low beach is a very narrow tongue of sand, which sepa-
rates the sea from a large and very deep lagoon. The Governor of the Marianas,
who was on board the *Narvaez*, thought that by cutting through this tongue
an excellent harbour would be formed, but such a harbour would be useless.*
The volcano at the N.E. end is in lat. 18° 7' N., long. 145° 52' E.

* There is a tale of *treasure* being buried on Pagan, in about 1820 or 1822. The captain
of an English schooner came to Agana in order to seek for the treasure he had buried here
when captain of an English brig, which had come from some port in Peru or Chili at the
time of the war of independence. The inhabitants had placed their valuables on board the

AGRIGAN or Grigan Island, 41 miles N. by W. $\frac{1}{2}$ W. from Pagan, is about 6 miles long. N.W. and S.E., and $2\frac{1}{2}$ miles wide, having on it two high peaks, apparently a former volcano. Wilkes, by an imperfect observation, made it to be 2,300 ft. high. To the S.W. of the island there is, from what M. Freycinet was assured, a small plain, in front of which there is bad anchorage, on account of the violence of the currents. Some Americans and Sandwich islanders established themselves on the S.W. side of this island, but were forcibly removed by the Governor of Guam, as before stated. Capt. Sanchez y Zayas thinks that the above elevation given by Wilkes is very much in excess, as he considered it not more than two-thirds of that height.

Agrigan, seen from a great distance from the South, assumes the form of a perfect trapezium with two small eminences at the upper angles. It is safe all round, and it is very steep. The anchorage may be easily known, because it is in front of the only sandy beach on the island. Bottom will not be found till within 4 cables of the beach, and then the depth is regular, from 15 to 17 fathoms, black sand. The only anchorage is that taken by the *Narvaez*, in 11 fathoms, with the S.W. point of Agrigan bearing N.N.W., and the South point S. 64° E., about a mile from the landing-place, and 3 or 4 cables off shore. To the southward was a large light-coloured patch like shoal water, but there was not less than 6 fathoms water on it. The landing is very bad. The steep beach is of very coarse black sand, very light, and evidently of volcanic origin.

On Agrigan are abundance of cocoa-nuts, bananas, and tropical roots, as well as a large quantity of pigs, goats, and poultry. A curing-establishment was formed here, similar to that on Tinian, but for want of means of communication it was abandoned, the *Narvaez* taking off the inhabitants. The island is evidently volcanic, but it is stated there are no lava streams, nor appearance of a crater, as formerly stated, but Capt. Knorr, of the *Hertha*, says that "luxuriant vegetation covered the two volcanos up to their smoking craters." The soil is very fertile, and the island is covered from shore to summit with vegetation. The S.E. point is in lat. $18^{\circ} 46' 20''$ N., long. $145^{\circ} 41' 45''$ E.*

brig, which sailed off in the night, by the aid of two sailors, whom he afterwards assassinated. The papers he had, apparently fixed the place in Pagan. But the whole story is so vague that it may be fairly placed among the many similar romances.

* *Mangs* or *Manjas Islands* have been another difficulty in the hydrography of the Marianas. They were first stated by La Pérouse to bear 28° W. from Asuncion, but whether to N.N.W. or S.S.W. was not clear. In the account of Freycinet's voyage they were said to have been seen from the *Uranis's* mast-head, bearing to the S.S.W. of Asuncion, and are so placed on Duperrey's chart. But as La Pérouse says that he never saw the Urracas, they were placed to the N.N.W. of Asuncion on the French and Spanish charts of 1862, so that they have had two positions on the charts, and, in addition to this, the Admiralty chart gave the name to the Urracas.

This mystery was also cleared up by the *Narvaez*. Her commander steamed over their sites, and found no evidence of their existence. The conclusion he justly arrived at was,

ASUNCION or Assumption Island, 54 miles N. by W. from Agrigan, is a perfect volcanic cone about a mile in diameter, and with a large crater on the summit, which rises to a height of 2,848 ft. Its eastern side is of lava, and the sea washes up it to a considerable height, at least 260 ft., or double the height of the masts, a certain indication of the great depth of the sea at its base. There is scarcely any vegetation on the eastern side. At the North end of the island is a rock through which the sea has worn a passage. About a cable to the North of this two rocky heads show themselves.

On the West side the slope of the mountain is less rapid, and forms a perfect cone; but, like the other, the coast is perpendicular. Outside the southern and lowest part of the island there are two or three rocks, but not more than half a cable's length off. All this side is covered with a vigorous tropical vegetation. It is not known whether any one has landed on it since La Pérouse did on December 14th, 1786, when he carefully observed its position on shore. La Pérouse anchored here in 30 fathoms, but the *Narvaez* could find no bottom at this depth anywhere round the island.

Asuncion is very lofty, and is consequently from its small base a remarkable object. La Pérouse estimated it at 1,200 ft.; Duperrey at 1,700; but Capt. Sanchez y Zayas says these figures are evidently too small, and by two angular measurements he obtained a mean height of 802.5 metres, or 2,632 ft. The crater is in lat. $19^{\circ} 45' N.$, long. $145^{\circ} 29' E.$

URRACAS ISLANDS, 22 miles N.W. by N. $\frac{1}{2}$ N. from Assumption, are three in number, the largest to the West, the smallest to the N.E. They are moderately high, very irregular, and lie in a circle 2 or 3 miles in diameter, connected by breakers which complete the circle around them. The outer part of this circle is of a regular form, but the inner sides are much cut up. The outer side is of a reddish lava, the inner black and calcined. The group appears to have been the summit or crater of an immense volcano, or the ruins of a former peak, twin-brother to Asuncion. It is entirely desolate, neither tree, brushwood, nor rivulet is to be seen. Its outer side, beyond the encircling rocks, is evidently very deep, and they drop suddenly into deep water.

It is far from being dangerous; in fact, they form an excellent point of recognition, as they may be seen at a great distance. They lie in latitude $20^{\circ} 6' 35'' N.$, long. $145^{\circ} 20' E.$

FARALLON DE PAJAROS, or Guy Rock, the northernmost of the Marianas, was discovered by Douglas, September 12, 1789, and is placed under the first name in Espiñosa's chart. It was first properly described by Capt. Sanchez y Zayas, in 1865. It is really an island, and not a rock or farallon, being about 1,039 ft. high, and $1\frac{1}{2}$ mile in diameter. It is a conical

that this extensive reef and islets were identical with the Urracas, and that La Pérouse's account will perfectly bear out this, as they are clearly visible from Asuncion, and nothing else is in sight in that direction.

mountain, crowned with a volcano in activity, for four or five columns of very thick and black smoke were seen to the S.W. of the summit at a spot which resembled a crater. On the South, East, and North sides the coast is perpendicular, and the sea beats heavily upon them. To the S.E. a large rock lies against the coast, and near this are several others, one of which is very remarkable, resembling a sharp-pointed steeple; a similar rock lies on the S.W. side. To the West the side of the mountain slopes more gradually, but there are no off-lying dangers on this side. There is no landing, and only a little vegetation near the South shore. It is unknown if there is any anchorage. According to Commander Sanchez y Zayas, the summit is in lat. $90^{\circ} 30' N.$, long. $145^{\circ} 8' 40'' E.$, but according to Capt. Knorr, of the German corvette *Hertha*, who landed on the South point in 1876, it is in lat. $20^{\circ} 33'$, long. $144^{\circ} 48\frac{1}{2}'$. In 1877 it was sighted by the U.S. ship *Alert*, and its approximate position calculated to be lat. $20^{\circ} 36'$, long. $145^{\circ} 12'$. The volcano on each occasion was emitting dense volumes of smoke.

It would thus appear probable that there are two islands, some 20 or 30 miles apart, in this neighbourhood, closely resembling each other. Captain Knorr estimates the height of the island he landed on as 850 ft.; its shape circular, with a circumference of about 5 miles.

Britomart Reef.—In 1869, Capt. Bartlett, of the British barque *Britomart*, passed close to a reef, level with the water, and from 400 to 500 ft. long, in lat. $19^{\circ} 18' N.$, long. $141^{\circ} 34' E.$ It was unsuccessfully searched for by the U.S. ship *Alert*, in 1881.

LINDSAY ISLAND.—This island was discovered by Mr. Lindsay, of the British schooner *Amelia*, during a calm, on Christmas-day, 1848. It appeared about 50 ft. high, and 4 miles in length, very barren, and of a dark brown colour. Of its position, lat. $19^{\circ} 20' N.$, long. $141^{\circ} 54' E.$, its discoverer speaks confidently, having proved the rate of his chronometer only two days previously at the islands of Origan and Asuncion.

But Capt. Bartlett, of the *Britomart*, passed over this position in 1869, when it was not visible from the mast-head in fine clear daylight, and it was also searched for in vain by the U.S. ship *Alert*, in 1881.

FLORENCE SHOAL.—Capt. E. Wadsworth, of the *Florence*, reports as follows:—"April 13th, 1862, lat. $18^{\circ} 6' N.$, long. $143^{\circ} 18' E.$, we passed over a shoal of 2 miles in extent; got a cast of the lead in 10 fathoms, coral, but was off the bank before we could sound again. Previous to sounding we passed over some places much shoaler, probably not more than 5 or 6 fathoms; I called it Florence Shoal." No further report has been made.

Anson Shoal.—On the old charts a shoal is shown at 140 miles East of Luzon, in lat. $17^{\circ} 35' N.$, long. $124^{\circ} 50' E.$ It may have been seen by Capt. Ayer, in the *Earl of Clare*, March, 1848, who saw bottom of large white shells and dark-coloured rocks, the water not discoloured, but took no soundings, in lat. $17^{\circ} 50' N.$, long. $124^{\circ} 40' E.$ *

Dugay Trouin Reef.—Capt. Denier, of the French barque *Dugay Trouin*, states that he saw a reef in lat. $19^{\circ} 5' N.$, long. $124^{\circ} 43' E.$ It broke very little, with a calm sea.—*Tijdschrift voor het Zeewezen*, 1875, p. 240.

The Philippine Islands, which limit the North Pacific to the westward, between the parallels included in this Chapter, are described in our *Directory for the Indian Archipelago, &c.*, 1878, pages 585—606 and 895—916.

* Several other shoals are found on the old charts in the neighbourhood of the Marianas, but the positions are so vague, both in latitude and longitude, that nothing certain can be said about them. The following is an enumeration of the chief of them:—

A shoal, from Spanish charts, is marked at 5° to the eastward of Anson Shoal.

A reef, in lat. $16^{\circ} 32' N.$, long. $143^{\circ} 22' E.$, from the Honolulu Friend.

An island, in lat. $17^{\circ} 0' N.$, long. $136^{\circ} 0' E.$, from whaler report.

A reef, in lat. $17^{\circ} 6' N.$, long. $159^{\circ} 14' E.$, from whaler report. Commander Skerrett, U.S. ship *Portsmouth*, searched unsuccessfully for this reef.

Folger Island, in lat. $16^{\circ} 21' N.$, long. $155^{\circ} 19' E.$, was passed over by the flag-ship of the United States' Exploring Expedition.

A doubtful shoal, in lat. $15^{\circ} 30' N.$, long. $141^{\circ} 10' E.$, was unsuccessfully searched for by the U.S. ship *Alert*, in 1881.

Spanish Islands, in lat. $13^{\circ} 55' N.$, long. $142^{\circ} 10' E.$

Anson Islands, repeated, in lat. $13^{\circ} 0' N.$, long. $141^{\circ} 35' E.$

Islands from the Spanish charts, in $13^{\circ} 20' N.$, $138^{\circ} 30' E.$ (The United States' Exploring Expedition passed near these last positions.)

Mira-por-ee, in lat. $14^{\circ} 20'$, long. $143^{\circ} 20'$, may refer to the Santa Rosa Bank, if it exists, or it is otherwise unknown. *Garbancos*, a degree to the southward, may be the same, but cannot be determined.

CHAPTER XIV.

ISLANDS TO THE NORTHWARD OF LAT. 20° N., INCLUDING THE HAWAIIAN OR SANDWICH ISLANDS.

THE SANDWICH ISLANDS.

THESE islands were discovered by Captain Cook, in his last and unfortunate voyage. Proceeding from Tahiti, he made the land of Atooi and Woahoo, to the North and N.E., on Sunday, January 18, 1778. They were named by him the Sandwich Islands, in honour of the Earl of Sandwich, the then First Lord of the Admiralty, under whose administration he had enriched geography with so many and splendid discoveries.

Although to Cook belongs the honour of thus making them really known to Europe, there are some proofs that they had been previously seen by the early Spanish voyagers, the first of whom was Juan Gaetano, in 1542, who made the first voyage from New Spain to the coast of Asia, though there is no account that he saw them. On the old Spanish charts there is a group marked in the same latitude, but much farther to the eastward than the Sandwich Islands; the southernmost and largest of these is called *La Mesa* (the table); to the N.E. of this is *La Desgraciada* (unfavoured); and to the N.W. is a group of six, collectively called *Los Monjes* (the monks). In the different charts of Lord Anson, taken with the Manila galleon, and those noticed by Burney (vol. v.), they are placed from 10° to 22° farther East than the Sandwich group, and were unsuccessfully sought for by La Pérouse, Vancouver, and others. But as the ancients determined their longitudes nearly by chance, the conclusion is almost irresistible that this group is intended for those under consideration. In this view, if the islands were seen at a distance, *La Mesa* would answer for the flat-topped Mauna Loa in Hawaii, and it is here now suggested that *La Desgraciada* would answer to Mauna Kea; Fleurieu, who was the first to point out this subject, considered that *La Desgraciada* might be a separate and undiscovered island. *Los Monjes* would represent the western islands of the windward group, Oahu, Maui, &c., and thus, without much difficulty, all discrepancies would be reconciled except that of longitude.

Other evidences exist of some prior knowledge of European people. Cook

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found in his first interview two pieces of iron, which could only be derived from Europeans, a piece of iron hoop 2 inches long, and an apparent point of a broadsword. The feather head-dresses, in the form of European helmets, and the grotesque heads of the same material, which he procured, and are now to be seen in the ethnological room of the British Museum, also indicate a similar origin of ideas. Added to this, the adoration paid to Cook, as the looked-for god, combined with the other traditionary evidence, prove that some former, though nearly forgotten, intercourse had taken place. Be that as it may, to Cook undoubtedly belongs the real discovery of the Sandwich Islands as now known.

It will be unnecessary to enter into the details of the progress of these islands in their early days of European intercourse.

After their discovery they were not visited till 1786, when Capts. Portlock and Dixon anchored at Oahu. La Pérouse visited Maui about the same time. Vancouver spent several months here in 1792 and 1793. He introduced the present breed of cattle, and during his stay the island of Hawaii was ceded to the British crown. The first missionaries were landed at Kairua, in Hawaii, February 4, 1820, from Boston, United States. Some from England soon followed, and their zeal and industry soon effected a wondrous change in the character of their converts; and one most prominent circumstance arising out of it was the visit of the King Liho-Liho and his queen, with a native suite, to England, in 1822. They unfortunately died soon after their arrival. H.M.S. *Blonde*, under the command of Lord Byron, was commissioned to convey their bodies back to their kingdom, a proceeding which made a most favourable impression in Hawaii. Matters would have gone on well but for religious intolerance. The Protestant missionaries, both English and American, had increased; but in 1827 some Romish priests were introduced; they were expelled in 1830. In 1836 the Romish propaganda again introduced themselves, but great bigotry on both sides led to most serious results. It gave occasion to the French government to act with very great harshness, and finally to take possession of the islands.

The most prominent circumstance in this affair is that of the *Clementine*, a brigantine under the British flag, in 1839, which was forcibly entered, and made to retain on board two French missionaries brought by her on her late voyage from California. To adjust this outrage, Captain Sir Edward Belcher endeavoured to convince the missionaries and the king (Kamehameha III.) of the impropriety of this step. The French frigate *La Vénus*, 60 guns, appeared at this critical moment, and Captain Du Petit Thouars acted with Sir Edward Belcher in the matter, and the missionaries were for a time landed, and an acknowledgment given that reparation should be made to the owners of the *Clementine*. After this the government and the state of society became disorganised, and after much controversy the French took possession of the Sandwich Islands, August 25, 1849.

This interference was subsequently adjusted, and the power of the king settled on a firm basis. A constitution simple, but stringent, and adapted to the requirements of the people, was promulgated in 1864, and the integrity of the kingdom has been guaranteed by a tripartite treaty between England, France, and the United States. The government is monarchical, and based largely on that of Great Britain. The king governs by a cabinet and a legislative chamber. Each island has its viceroy, and life, property, and justice are as secure as in any country in the world. Unfortunately party politics and intrigues mar at times what might otherwise be the perfect happiness of a simple community.

The natives and their habits have been too often described to need much being said here. When Cook first landed, their astonishment was extreme. They were above the middle size, and well made; their complexion rather darker than those of Tahiti, and altogether not so handsome a people. Most of their former customs, so much dilated on in the early accounts, have passed away, and are generally superseded by European habits and manners, not perhaps altogether advantageous to them.

The estimate of Cook, in 1779, that there were 400,000, is generally believed to be much too large. Probably 300,000 would be nearer the truth. One thing is certain, that there must have been a vastly greater population then than now, as is evidenced by the rich taro land now lying waste on all the islands; and in the districts of Kau, Waimea, and Kohala, on Hawaii, it will be very evident that three or four times the number of people must have lived to have cultivated it.

The following statistics will show that the decrease has been rapid. The population in 1823 was estimated at 142,050; and according to the census of 1832, 130,315; and from that of 1836, 108,579. The decrease appears to have been in progress almost from the date of their discovery. One cause, at least, has added to this: the number of young men who left the islands in whalers and other ships, and never returned. Another cause was the mortality of 1848, the "year of death," when it is supposed that 10,000 were swept from the islands by the measles, whooping-cough, and influenza combined.

The last census, taken in December, 1884, gave the following as the result of the population, by which it will be seen that the numbers are increasing, but this is owing to the foreign element, chiefly consisting of Chinese and Portuguese immigrants, employed on the sugar plantations, &c. At the census of 1878 the natives numbered 44,088, the half-castes 3,420, and the foreigners 10,477. In 1884 the natives numbered 40,014, and the half-castes 4,218. Besides the islands thus enumerated there are *Molokini*, *Lenua*, *Kaula*, and *Nihoa*, which are uninhabited, barren, and very small. The area of the islands is according to the estimate of the Hawaiian government survey.

PRESENT POPULATION OF THE KINGDOM.

	Area sq. geo. m.	Foreigners.	Natives.	Total.
Hawaii	4,210	11,929	13,062	24,991
Maui	760	6,491	9,479	16,970
Oahu	600	12,713	15,295	28,008
Molokai	270	272	2,342	2,614
Lanai	150			
Kauai	590	4,881	4,064	8,935
Niihau	97			
Kahulaue....	63	0	0	0
Total.....	6,740	36,346	44,232	80,578

The present king, Kalakaua, was elected in 1874, in succession to Lunalilo, the successor of Kamehameha V., who died without an heir in 1872. Queen Emma, the widow of King Kamehameha IV., and who contested the election, died in the spring of 1885. Under the beneficent rule of these monarchs, great progress has been made in the civilisation of the archipelago, and in developing its resources.*

The one great source of prosperity in former years was the whale-fishery. This important branch of commerce, which has been referred to previously, attracted such a concourse of the New England and other whalers to the North Pacific, that in 1859 the number which visited the Sandwich Islands to refit amounted to 549 square-rigged vessels. In 1846, 674 vessels touched here, chiefly whalers. Of the moral advantage to the natives of this influx of licentious sailors, little can be said, but it brought much wealth. After that year there was a very sudden and great decrease. The amount of sperm and whale oil, and whalebone, decreased to less than one-half, or one-third of what it was in 1858, when it was at the maximum, 222,464 gallons sperm, 2,551,382 gallons whale oil, and 1,614,710 lbs. whalebone; reduced to 47,859 gallons sperm, 782,086 gallons whale oil, 572,900 lbs. whalebone, in 1860; and these items became reduced, in 1862, to less than one-third of what they were in 1860. Since this period this source of revenue has much declined. In 1881 only 19 whaling vessels called here.

The development of commerce and the increase of the population in California, and the consequent trade which has steadily progressed with San Fran-

* Among the more recent works containing descriptions of these islands, we may mention "Northern California, Oregon, and the Sandwich Islands," by C. Nordhoff, 1874; "The Hawaiian Archipelago," an interesting series of letters, by Isabella L. Bird, 1875; "Die Leeward-Inseln der Hawaii-Gruppe," von Francis Birgham, in Mittheilungen aus J. Perthes' Geographischer Anstalt, 1878, pp. 263-7; "Die Sandwich-Inseln," by Graf R. Anrep-Elmt, Leipzig, 1885; "The Honolulu Directory," an annual publication; and "The Hawaiian Almanac and Annual."

cisco, and also the advance of British Columbia, and the intercourse with the free port of Victoria, are now the real sources of prosperity to the Hawaiian Islands. They may be considered as the "West Indies" of N.W. America, from their fertility and great adaptability for the growth of sugar, coffee, cotton, &c., capable of supplying the whole of the countries on the N.E. Pacific with these necessaries, which are now admitted into the United States free of duty.*

There are numerous sugar-plantations on the various islands, but chiefly on Maui, some of them being connected by railway with the ports of shipment. In 1884, 63,685 tons of sugar were exported, and 4,258 tons of rice. Wool is also largely grown, the export in 1884 amounting to 407,623 lbs. There were above 1,000,000 sheep, including large flocks of merinos, on the islands. The island of Niihau was purchased from the government by a Scotch family from Canterbury, New Zealand, for a sheep farm. Cotton, which was largely grown, failed on account of drought and from worms, and coffee also suffers from blight. In 1884, the value of the exports amounted to 7,977,909 dollars, and the imports in 1883, principally clothing, provisions, ironware, and lumber, to 5,624,240 dollars, the trade being chiefly with the United States. The coinage is similar to the American.

Excellent coal from Vancouver Island can be had for about 11 dollars, or 44s. per ton, Australian coal for the same price, and the best Welsh steam coal at about 14 dollars, or 56s. per ton.

Since the completion of railway communication between New York and San Francisco, lines of steamers have been established between the latter port and China and Japan, and also to New Zealand and Australia, the steamers on the latter service calling at the Sandwich Islands twice monthly. On the completion of the Canadian Pacific Railway, it is also probable that other lines of steamers will be established, some of which would call here. There is also a line of fine steamers running between San Francisco and Honolulu twice a month.

The Winds, which are most prevalent in the Hawaiian Archipelago, are those from the north-eastward. This trade wind, which prevails for a great portion of the year, is interrupted when the sun is in high South latitude, or during the northern winter. From the geographical position of the islands near to the tropic, the northern edge of the trade wind recedes to the southward of their latitude in this season, and then the anti-trade wind from the

* When it is remembered that the commerce and productions of the volcanic island of Mauritius, in the same latitude South that these islands are North, are at the present day nearly thirty times greater than those of the Sandwich Islands, whilst the latter have several times greater area and available land, as well as greater diversity of climate and resources, it will be readily seen what an opening is presented for future commerce, and how valuable this trade may become to Great Britain, especially if Victoria be preserved as a free port.—*Mr. Consul-General Syngé, 1865.*

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westward, shifting between N.W. and S.W., is frequently heavy and changeable, being a struggle between the two systems, and forming the equivalent to what are called the "horse latitudes," in the North Atlantic. They bring abundant rain on to the opposite sides of the islands, which have the rain during the summer months. These westerly winds set in usually in January, and continue till the middle of April, or commencement of May, when the trade wind again sets in.

During H.M.S. *Petrel's* cruise among the Sandwich Islands in September, October, and part of November, 1875, the trade wind was frequently interrupted by rains, calms, and southerly winds, except in the channels between the islands, where it seldom failed. On the West and S.W. sides of Maui, south-easterly winds prevailed; these winds were, however, occasionally interrupted by the trade wind, which blew over the low isthmus. At night, calms prevailed near all the islands.

The Climate of the Sandwich Islands is generally temperate and healthy, for a sub-tropical region; it would appear to resemble that of the West Indies, though more temperate in the higher lands, being not too hot to prevent white men working, even in agricultural pursuits. From the constant nature of the wind, the temperature and climate generally vary on different sides of the islands, and from their insular character and their great elevation, the clouds are intercepted, and rain is consequently abundant in some localities, and drought the characteristic of others. Thus the North side of Kauai is 3° cooler than the South side from this cause, and it rains 9 months of the year, and from this the country is clothed in perpetual green. On the West side of Hawaii, on the other hand, rain seldom falls on the coast, and a rainy day once a year is considered remarkable. The range of the thermometer on the windward side of the islands is from 54° to 86°; on the lee side it seldom falls so low as the former temperature. The climate is healthy, none of the inter-tropical diseases are known, nor do fever, ague, or cholera occur.

Bishop Staley gives the following as a brief summary of the climate. Situated only just within the limit of the northern tropic, and in the region of the N.E. trades, which blow the greater part of the year, and convey the ocean vapour, condensed into clouds, over the mountains and table lands, then to fall in fertilizing showers, the country enjoys a luxuriant and delicious climate. The average annual temperature is 77° Fahr., with only a few degrees of variation above and below. But the local climates are varied, depending on aspect and elevation. At Waimea, on a plateau about 4,000 ft. above the sea level, in the North of Hawaii, a fire in your bed-room is necessary. On the other hand the houses at Honolulu and many other places are built without chimneys, no fires being needed at any period of the year. Generally speaking, there is more rain on the windward than on the leeward sides of the island. Hence the rich hues of the eastern slopes of Hawaii, covered with verdure and cultivation,

contrast strongly with the bare and arid look of the coast on the greater part of the western side.

There is no tropical wet season, in the ordinary sense of the term—that is, at the summer epoch. On the contrary, the wettest part of the year is when the sun's vertical is farthest removed from the northern tropic, viz., in December and January. Then abundant rain falls, storms of great violence, called *Konas*, suddenly arise, and the inter-island navigation has to be suspended (1868).

On the West side of Hawaii the land and sea-breezes are very regular; there are also strong North winds, but the most severe gales are those from S.W., which, as stated, the natives term *kona*. These last from a few hours to two or even three days, and are followed by rain; they are seldom strong enough to injure the houses.

The Currents in the immediate vicinity of the islands at first sight would seem to be very uncertain; sometimes setting to windward, and at other times to leeward, without any regularity. They do not appear to be governed by the winds nor other cause; they frequently set to windward against a fresh breeze.

But whatever may be the irregularity of the current within the influence of the archipelago, a circumstance related by Vancouver incontestably demonstrates that, beyond them, they follow, at least at times, some general law. When at Kauai, he saw a noble canoe, 61½ ft. long, formed from a single pine tree, which wood does not grow on the islands. Its origin was more singular than the canoe itself. It was a tree drifted on to the East end of Kauai in a perfectly sound state, without a shake or a bruise. This circumstance of fir timber being drifted on to the northern sides of the islands is by no means uncommon, and but little doubt can be entertained that they had come from the West coast of America. This would prove, as would at once be supposed, that the usual current in the offing came from N.E.

Another circumstance also bears with great weight upon the current drifts and the direction of the winds. On a former page (301) we have noticed the singular circumstance of the wreck of a Japanese junk at the entrance of Columbia River, in Oregon, in 1833. About the same time, a junk laden with fish, with nine hands on board, left one of the southern islands of the Japanese archipelago for Yedo, but encountering a typhoon, was driven to sea. After wandering about the ocean for ten or eleven months, they anchored, on the last Sunday of December, 1832, near the harbour of Waialea, Oahu. The Hawaiians, when they saw a strange people, much resembling themselves in person and in many of their habits, said, "It is plain now we come from Asia." How far their unwilling course was due to current of course cannot be exactly ascertained, but it would appear probable that, being blown off to the northward, the Kuro Siwo, a current relatively similar to the Gulf Stream of the Atlantic, may have carried them eastward, and then within range of the south-westerly current, which drifts pine timber.

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Sir Edward Belcher experienced a strong current to W.N.W. when off Honolulu, and it frequently runs at the rate of $1\frac{1}{2}$ mile per hour. These considerations must greatly influence all navigation conducted between the islands.

The Tides are comparatively inconsiderable, and, with the heavy swell setting upon the outer reefs, difficult to estimate, but they are very regular, flowing and ebbing six hours each. The *flood* comes from the eastward; and it is high water, on full and change of the moon, at $3^h 45^m$ apparent time. Their greatest rise is 2 ft. 7 in., and the water is always observed to be 4 inches higher when the moon is above the horizon than when it is below.

Earthquakes are common, especially in Hawaii, where the volcanos are still in activity. Of course they are more severe in that island than in the others, where the subterraneous fires seem to be extinct.

Several very severe visitations have been recorded since their discovery, and in some cases the phenomena, which have been carefully observed and recorded, afford very interesting subjects for the physical geographer. The earlier eruptions apparently arose from Kilauea, those of more recent times from Mauna Loa.

The first recorded is an eruption of Kilauea, in 1789. The next was an eruption from the same volcano in 1823, when the lava flowed to the sea at 12 miles from its source. The third was in 1832, and was an eruption from Kilauea, and also from the summit of Mauna Loa, when lava flowed for two or three weeks. The fourth was on May 30, 1840, when lava flowed from the side of Kilauea, and formed a stream 35 miles long, reaching the sea in five days.

The fifth eruption began on Mauna Loa on January 10th, 1842, when a stream of lava issued from its summit, and, running northward, it divided, one branch towards Hilo, and a second towards Kawaihae. On February 15th, 1852, another stream of lava issued from the same crater, and, with some interruptions, continued for a month, but did not reach the sea, its course being checked at only 10 miles from Hilo.

A most alarming eruption from Mauna Loa commenced on August 11th, 1855, and the lava continued to flow for thirteen months, until it covered an area estimated at 300 square miles. Again, on January 23rd, 1859, another great stream of lava burst forth, and flowed for six months, reaching the sea about 7 miles to the S.W. of Kawaihae.

The greatest eruption on record commenced by some slight premonitions, in March, 1868, by some earthquakes. These shocks became so numerous that 2,000 were counted in a few days. Some of these were very destructive, and accompanied by a great sea-wave and a mud eruption which swept away and buried villages, men, cattle, &c., and on April 7th, ten days after the first symptoms of the convulsion, a new crater opened on the flank of Mauna Loa; a stream of lava flowed into the sea half-way between Apua and the southern point, the mud-flow meanwhile wending its course to the North of this direction. One of the fairest parts of the island was thus in a single day converted

into a black-looking, desolate tract of cinders and mud. In many places in Kau the ground opened, chasms of unknown depth were formed, whence sulphurous exhalations were emitted; a fissure, some miles in length, extended inland from the coast, crossing one of the island high-roads, and so deflecting it that what were contrary sides before were, at the point of breakage, in one and the same straight line. The floor of the crater in the Kilauea volcano sank considerably. At Lahaina, upwards of 100 miles from the scene of the eruption, the column of cloud ascending from it was observed under an angle of $3^{\circ} 30'$, which (allowing for 500 ft. of altitude, the position of the observer) indicated a height of nearly 8 miles. So vast a body of vapour rushing visibly upwards with tremendous rapidity, proved the presence of an immense heat at its base; the great rarefaction by heat of the air near the new crater would cause a powerful upward draught; then the cold air, charged with the vapours of the surrounding sea, must rush in. For days after the eruption, the leeward islands were enveloped not only in a close oppressive atmosphere, but in clouds and heavy rains. A very distinct odour of sulphurous acid was perceptible at Honolulu, 180 miles distant, two days after the eruption. The earthquakes were continued at intervals for some months.

On the night of February 14th, 1877, Mauna Loa was again in eruption for about six hours only, and two streams of lava flowed down the mountain towards the South. The illumination was so brilliant that all parts of Hawaii were lighted up, and even on Maui, at a distance of 180 miles, the glare was so great that the planters of West Maui thought a great conflagration was taking place on their own island. On the 24th, a submarine eruption was observed at Karakakoa, at about a mile from the shore.—*Captain Mist, R.N., Geographical Magazine, May, 1877, p. 133.*

On May 10th, 1877, these islands were visited by a huge wave, which caused much destruction. It appears to have occurred simultaneously at about 4^h 45^m a.m., all over the group. Its range at different places was estimated to be as follows:—At Hilo, on the N.E. side of Hawaii, 36 ft.; at Karakakoa, on the West side, 30 ft.; at Kawaihae, on the N.W. side, 5 ft.; at Kahului, on the North side of Maui, 22 ft.; at Lahaina, on the N.W. side, 12 ft.; at Honolulu, 4 ft. 10 in.; and at Nawiliwili, on the South side of Kauai, 3 ft. As noticed on previous occasions, the rise at Hilo and Karakakoa were the greatest.

In 1880—1881, Mauna Loa was again in violent eruption, and emitted a vast stream of lava which at one time threatened to overwhelm the town of Hilo, the lava at last stopping near the edge of the town, about 50 miles from its source, and only three-quarters of a mile from the sea.*

The archipelago consists of twelve islands, which were discovered by Cook in his last voyage; of these five are uninhabited, and are barren rocks. They

* Those interested in this subject should refer to Mr. Brigham's "Memoir on the Hawaiian Volcanoes."

are divided into two groups, Windward and Leeward, according to their position with regard to Oahu, the central island. They will all be described in order, commencing with the S.E.

Throughout the archipelago there is every evidence of their upheaval, and the dates of these elevations are manifest in the conditions of the different islands. Those to the westward are the most ancient, Nihoa and Niihau are the oldest; Kauai, Molokai, and Maui follow; and Hawaii, the largest and most recent, is still in activity. But although it is asserted that the western islands are the oldest, it may not be strictly correct, except in the sense that the evidence of recent volcanic action is least evident there. But everywhere there are marks of a gradual or convulsive elevation of the group. On Molokai, in the middle of the islands, coral is found at 500 ft. elevation, and in Kauai coral beds lie at 4,000 ft. above the sea. It is in Hawaii itself, however, that the grandest evidence of the plutonic origin of the islands is most evident and active. In the other islands lava streams and extinct craters are recognisable, but in the great island some of the most terrible phenomena of volcanic disturbance have been shown in late years, as noticed previously.

There is very great variation between the orthography used by the early voyagers and that subsequently adopted by the missionaries on a more intimate knowledge of the language. The latter mode is, of course, to be considered as the correct one, and is that placed first in these pages.

HAWAII, the south-eastern, and by much the largest of the group, is called *Owhyhee* by Cook and others; Kotzebue calls it *O Wahi*; Freycinet and others, *Owhyhi*. All these words are representations of the same sound.

Hawaii is of a somewhat triangular form; the West side, running generally N. by W. $\frac{1}{4}$ W. and S. by E. $\frac{1}{4}$ E., is nearly 100 miles in length between the North and South points; the N.E. side is 76 miles, and the S.E. side is 60 miles long; so that its whole circumference may be taken as about 250 geographical, or 288 British statute miles.

The mountains of Hawaii do not ascend in peaks, as do many other volcanic islands, such as Eimeo or Teneriffe, but rise gradually and comparatively unbroken, particularly from the southern shore, to the lofty summit of Mauna Loa. Its appearance altogether is less romantic and picturesque than Tahiti, but it is more majestic and grand.

There are but few inland settlements on the East and N.W. parts of the island, but in general the interior is an uninhabited wilderness. There is a vast central valley between the three great mountains, a great desert of lava, of every known kind. It is only the northern plain, the eastern slope, and some portions of the South and West, which are productive, and where are to be found sugar estates, and cattle "ranches" and sheep "runs" equal to any in the world.

There are three principal mountains in Hawaii, Mauna Kea in the N.E.,

THE SANDWICH ISLANDS.

Mauna Hualalai in the N.W., and Mauna Loa in the South. As stated on a former page, they are active outlets of the subterranean fires which have formed the archipelago. The general direction being parallel to the great mountain chains of America on the one hand, and nearly that of Kamchatka, to which quarter it is directed, seems to indicate some general law in the structure of the earth, or that some fissures in the crust exist in this region.

Mauna Kea ("white mountain") is less evidently an active volcano than the others, and consists almost entirely of scorice, without any apparent craters. It may be characterized as a vast mound, surmounted with nine cones, the southernmost of which is the highest. Perhaps these cones may be considered as craters. Although a sister mountain to Mauna Loa, it is of very different form and apparent composition. On its summit frosts prevail, and vegetation continues up to within 1,000 ft. of its summit, and even higher. The plants also differ. Their height is singularly equal, Mauna Kea being only 155 feet higher than the summit of Mauna Loa, or 13,805 feet.

Mauna Hualalai, or *Huarari* (or Worraray, as it is called by Vancouver), although not of such gigantic proportions as the other two principal mountains, is yet very conspicuous. On its summit is a very extensive crater, which has been instrumental in wonderfully changing the surface of the surrounding country. Besides the central spiracle, hundreds of cone craters, or hills of scoriceous lava, may be seen from its summit, like excrescences on its sides. Its height is given as 8,275 feet.

Mauna Loa was, from Cook's first estimate, considered to be one of the highest mountains in the world. Although his calculation was in excess, it is still to be ranked with the loftiest. Its form is unique, and has been increasing, and is perhaps entirely formed from the overflow of its terminal crater. Its form is that of an extensive flattened dome, falling very gradually on its northern and eastern sides. Its summit was ascended, and numerous observations made here by the United States' Exploring Expedition, in 1841. The highest part of the edge of the summit crater was then found to be 13,760 ft. above the sea; later observations make it 13,650 ft. The crater is a most extensive one, its circumference being about 18½ statute miles, and possesses all those wonderful characteristics which have been so frequently described. This is the principal spiracle of Hawaii, and its recent eruptions have been among the most violent on record, as described on pages 1069—1070. This active volcano and its destructive effects renders this principal island in a great measure uninhabitable, and discourages any attempt at colonization.

Kilauea or *Kiraueah* Volcano lies on the side, as it were, and to the East of the summit of Mauna Loa. It is merely an immense crater, 3½ miles long, 2½ miles wide, and over 1,000 ft. deep, its highest part being elevated 4,400 feet. The bottom in the daytime looks like a heap of smouldering ruins; what is wonderful in the day becomes ten times more so at night. To the S.E. of

it is a line of craters, from some of which a great eruption occurred May 31, 1840.

Having thus described briefly and imperfectly these, the most wonderful features of the Pacific, we pass on to the coast, commencing with the S.E.

Cape Kumukahi, or *Kapoho Point*, the easternmost projection of Hawaii, has some sunken rocks off it. The country is exceedingly fertile; sugar-cane grows here in abundance, coffee succeeds well, as do indigo and tacca, from which arrowroot is made. The coast to the N.W. is a precipitous shore, about 15 ft. high, on which the sea beats with violence at all times. It is bestrewn with lava streams, apparently of old date. At 3 miles from the East point is *Puna*, where there is a large church, but no village, as the houses are much scattered. *Kanakiki*, a small village, is $1\frac{1}{2}$ mile from Puna. At $4\frac{1}{2}$ miles from the East point is a spot where an extensive stream of lava enters the sea, called *Nanavalie*. Prior to the eruption in 1840, the coast here was a continuous lava cliff; now it is occupied by three sand-hills, formed by the lava stream, of very singular formation, the highest 250 ft. There is no appearance of shoal water opposite, though such was stated to be the case.

HILO, *Waiakea*, or *Byron Bay*, is the first, indeed the only place of consequence to the seaman, on this windward side of the island, the anchorage being good, and the harbour capacious. Lord Byron called it *Hido* (Hilo), after the village in the bottom of the bay. Lieut. Malden called it after another village, *Waiakea*; and the third is from the name of the commander of H.M.S. *Blonde*, the first man-of-war that ever anchored here.

Hilo, the second town in population and commercial importance in the Hawaiian Islands, is situated on the S.W. side of this beautiful bay, and close southward of Waterfall Creek. Here the crescent shore slopes to the water's edge, terminating in a regular sandy beach, affording excellent landing for boats. The surrounding scenery is the most beautiful in the Sandwich Islands, but the climate is wet, showers occurring daily.

The population of Hilo proper, as near as can be ascertained, was 1,750. Of this, the active business portion is composed of foreigners, chiefly Americans, and there are many Chinese of the better class.

There are two substantial churches in Hilo. The Protestant church is large, indeed sufficiently commodious for the entire population of Hilo. The Roman Catholic church is also commodious, well constructed, and roofed with slate. It is finely situated, with its white towers and belfries, surmounted by two crosses, directly in front of the harbour. There are several schools, stores, an iron foundry, and all other accessories of civilization. There are several sugar plantations in the surrounding country.

The coast on the western side of the bay runs about N. by W. and S. by E., with a depth of 6 fathoms about 2 cables off it. At its head, and off the town of Hilo, the depth of 5 fathoms is found at from $3\frac{1}{2}$ to $5\frac{1}{2}$ cables off, the depth

North Pacific.

thence decreasing gradually to the shore. At $8\frac{1}{2}$ cables East of Hilo is the village of *Whyatea*, and here is the best landing place for boats, though it is easy to land anywhere on the beach in proper boats. At 4 cables N.N.E. of Whyatea is *Cocoa-nut Island*, lying close to the coast, in lat. $19^{\circ} 43' 51''$ N., long. $155^{\circ} 5' 15''$ W., with some rocks extending $1\frac{1}{2}$ cable N.W. of it.

Blonde Reef.—At nearly a mile E. by N. of Cocoa-nut Island a bank of $1\frac{1}{2}$ to 3 fathoms extends $1\frac{1}{2}$ mile off shore to the W.N.W., of irregular form as shown on the chart, and leaving a channel three-quarters of a mile wide between its western edge and the West shore of the bay, with a depth of 6 to 11 fathoms in it. When the wind blows strong, a heavy surf breaks upon this reef, but inside it is smooth. Its width averages about half a mile.

The anchorage, which is sheltered from the N.E. by Blonde Reef, is in 6 to 8 fathoms, stiff muddy bottom, the former depth being found eastward of Cocoa-nut Island, and the deeper water to the N.W. of it. It is only exposed between North and W. by N., from which quarter the wind never blows hard in summer, and but very rarely in the winter; only one northerly gale had been felt in two years. The tide rises about 4 ft., high water at sunset, and low water at daylight, being influenced by the sea and land breezes.

The harbour of Hilo, with little expense, could be made one of the safest and most commodious in the Pacific. By constructing a breakwater on the reef northward of Cocoa-nut Island it would be perfectly safe, landlocked, and sheltered at all times. This could be easily effected, as it is but a short distance to immense beds of basaltic, vitreous, and vesicular lava, which would resist the action of water for ages. The port is now more capacious than any other bay or harbour on the island, and it is not subject to violent gales from any quarter.

Supplies of fresh meat can be obtained, but vegetables and fruit are scarce. Firewood also can be purchased. There is a good watering-place up Waterfall Creek, within the mouth of Waialuku River, which is generally easy of access, except when the wind is blowing hard from the north-eastward; on such occasions the surf is high, and the rocky bar at the entrance then becomes dangerous for boats to pass. The water is excellent and abundant.

Lights.—About $1\frac{1}{2}$ mile N. by W. of Waterfall Creek is Cocoa-nut Cove, and near the edge of the cliffs, about a quarter of a mile farther northward, is a small white building, 14 ft. high, showing a *fixed bright* light, elevated 136 ft., and visible 10 miles, but it cannot be depended on. When bearing East it leads well northward of Blonde Reefs.

About a cable southward of Waterfall Creek there is a small pier, which forms a good landing-place in fine weather. A small *fixed red* light is exhibited on the pier. If visible, when bearing S. by W. $\frac{1}{4}$ W., this light leads clear of the western edge of Blonde Reefs.

Directions.—The following directions are based on those by Lieut. Malden. In steering for the anchorage, with the sea-breeze, when about 3 miles from

the bottom of the bay you will be well outside Blonde Reef, in 25 to 30 fathoms. The West shore must then be kept close on board. To clear the West end of Blonde Reef, keep Puneo huts, on the N.W. side of Waterfall Creek, on with the *eastern* side of a remarkable green hill (an extinguished volcano), impossible to be mistaken, bearing by compass S.S.W., till *Turret Rock* (about 15 ft. high) bears W. by S., when you will be in 7 or 8 fathoms, stiff muddy bottom, and can steer S.E. by E. for the anchorage. The whole of the West coast is composed of cliffs, Puneo huts standing upon the last and most southerly visible cliff. When close off the North extreme of Blonde Reef a deep inlet, called *Cocoa-nut Cove*, in consequence of there being a group of these trees at the entrance, is quite open, bearing W. by N.

As there are no dangers in the channel, and it is more than three-quarters of a mile wide, there is quite room to beat any vessel out against the sea-breeze, which, if it be fresh and steady, is preferable to running out at daylight with the land wind. The land wind frequently leaves you in the lurch, and you are obliged to come-to in deep water, to prevent being driven upon the rocky cliffs of the West coast. Indeed, in turning out of the bay, with a good strong sea-breeze, as soon as you are to windward of the reef, she should keep beating to windward in a N.E. or N.E. by E. direction, not attempting to weather Makahanalua or Point Blonde, the North point of the bay, until it can be done with certainty, at the distance of 5 or 6 miles at least; for, when at 3 or 4 miles northward of Cocoa-nut Cove, there is no bottom with 50 fathoms, within half a mile of the shore. So that, should a sailing vessel in this situation be becalmed, her state would be most dangerous, a heavy swell and current constantly setting against the precipitous cliffs.

Capt. Wilkes remarks:—I cannot but view the Bay of Hilo as a safe anchorage. We were detained there about three months, and never had a gale strong enough to ride our anchors, though these were the winter months, December, January, and February. At times, however, a considerable swell rolled in. Some most delightful weather was experienced in February.

The whole settlement forms a pretty cluster; the paths and roadsides are planted with pine-apples, and the soil covered with a rank vegetation. Waiakea Point is on the opposite side of the bay from Hilo, at rather more than a mile off; the path between leads along a sandy beach, on which the surf continually breaks, and at times with great violence.

"The scene which the island presents, as viewed from the anchorage in Hilo Bay, is both novel and splendid; the shores are studded with extensive groves of cocoa-nut and bread-fruit trees, interspersed with plantations of sugar-cane. Through these numerous streams are seen hurrying to the ocean; to this succeeds a belt of some miles in width, free from woods, but clothed in verdure; beyond is a wider belt of forest, whose trees, as they rise high from the sea, change their character from the vegetation of the tropics to that of the

polar regions; and, above all, tower the snow-capped summits of the mountains."—(Wilkes, vol. iv., p. 110.)

Hilo, viewed from the harbour, presents much the same tropical appearance as other parts of the islands, and as a panoramic view it is not surpassed in beauty and grandeur of scenery by any other spot in the kingdom. There is a luxuriousness and freshness in the vegetation, a living green in the verdure and foliage, that combine to present an almost perfect picture. The crescent sweep of the bay, ending with the cluster of cocoa-nuts on the island, the towering heights of Mauna Kea behind, the majestic dome of Mauna Loa, all help to form a landscape scene seldom equalled.

The following remarks are by Mr. H. Thompson, R.N., master of H.M.S. *Talbot*, which was here in June, 1845 :—

The anchorage in Byron Bay is open to all winds from North to E. by N., being only sheltered in that direction by an extensive sunken reef, Blonde Reef, which sufficiently breaks the sea to render a ship comparatively safe behind it. The pilot told me that during his residence of twenty years here he had seen some very strong gales from the N.E., but had never known any vessel suffer by them; yet I am of opinion that on such occasions a vessel would find it very heavy riding, and should be provided with good ground tackle.

There is seldom any difficulty experienced in entering this bay, as the sea-breeze blows right in, and should it be ever so light, with the assistance of the swell astern, and boats towing if necessary, the anchorage will be gained in safety. But the egress is not so easy; it is often attended with difficulty, and sometimes with risk. The channel between the reef and the shore is rather too narrow to allow a square-rigged vessel to work through, unless she be a small one, and then it should be only with a commanding breeze.

To sail out of Byron Bay, a vessel should start with the first of the land-breeze, which generally comes off soon after midnight, so as to get a good offing before it ceases, otherwise, if daylight is waited for, the land wind will seldom hold long enough to take a vessel sufficiently off shore to leave her in a safe position; and should the sea-breeze fail to blow home to the coast during the day, which not unfrequently happens, thereby leaving her exposed, helpless, to a heavy swell setting directly towards the reef, a vessel's own boats' towing would have but little effect against it. There is a deep-water anchorage outside the reef, and there is also anchorage in the channel, in 10 to 12 fathoms; but both these anchorages are unsafe when blowing fresh.

From the similarity of the coast, and the want of remarkable objects in the vicinity of this bay, there are no conspicuous marks that would guide a vessel to or from the anchorage. The general rule for approaching the anchorage is to close the land a little to the northward, and run down along shore rather within the distance of half a mile, which will lead a vessel a little inside the North extremity of Blonde Reef, which may be seen from a slight elevation

above the deck. There is a long gulley running up the land in a southerly direction from Cocoa-nut Cove, which forms a good object to steer for when once made out, as it leads close to the entrance of the channel; it appears like a dark mark in the land, and there is nothing in that vicinity which resembles it.

The Coast to the northward of Hilo is somewhat peculiar; it is a steep bluff, rising about 200 ft.; this is cut into small breaks, called here "gulches," within which the villages are generally situated, and the natives grow bananas and taro. These gulches are ravines from 800 to 1,000 ft. deep, which have been apparently worn by water-courses. There is no landing for boats, for all along the coast the surf beats on the rocks with great violence.

Beyond Hilo Bay the N.E. coast of Hawaii is a lee shore, without shelter or anchorage. The coast is firm and compact, terminating generally in steep rocky cliffs, with a few small indented bays, rendered easily accessible to the native canoes by the sandy beaches that bound them. From these rugged rocky cliffs many streams of water fall into the ocean.

Laupaho, several miles northward of Hilo, was the great pulu dépôt for this side of the mountain, and is a pleasant-looking hamlet, situated at the mouth of a deep ravine.

Capt. Sir Edward Belcher approached these islands from the E.S.E., July 7, 1837, and passing within 3 or 4 miles of the breaker line, witnessed those numerous cascades resulting from the showers emanating from the heavy clouds which capped the summits of Maui and Hawaii. "No description can convey the idea of the number and variety of the silver threads which they exhibited; and a sketch, including twenty leaps within 100 or 200 yards, would appear almost a burlesque, yet such was the fact."

The south-eastern portion of this section of the land has a very dreary aspect; Vancouver says it was perfectly uncultivated, and nearly destitute of habitations; those which are to be seen are small, and thinly scattered. Advancing to the N.W., the population and cultivation increase. At about 15 miles from *Healakaka Point* (lat. $20^{\circ} 3'$), which is called by Vancouver the N.E. point, the coast is composed of a cluster of remarkably high, steep, rugged, and romantic cliffs, discharging from their naked summits many rapid cataracts into the ocean. The rushing of these impetuous torrents down the black, barren surface of the rocky cliffs, contrasted with the enchanting, cultivated, and populous country to the East and West, and behind this dreary frontier, for a considerable distance up the sides of the lofty mountains, on approaching them in the offing present a very beautiful and picturesque appearance. Nearly in the centre of these cliffs is a tolerably deep, small bay, off the *Waimanu Valley*, much resembling in appearance, and most other respects, the bay in the island of St. Helena; but it seems too much exposed to the sea and the prevalent wind to be an eligible place for shipping. At 3 miles to the west-

ward of this bay, off the western extremity of these cliffs, lie some rocky islets, a little distance from the land.

Westward of these cliffs there are soundings off shore, as Vancouver found 7 fathoms at 2 miles off, the North (West) point bearing S. 70° W., 9 miles distant. The sea breaks with great violence near the shore at this part, and so continues all the way to the N.W. point of the island. There was a very heavy, confused, irregular sea, which was suspected to arise from a very sudden decrease in its depth, and the effects of a strong gale.

Mahukona is a small port where the coasting steamers call, and from hence there is a railway to Kohala and Niulii, for the transport of sugar, &c., from the plantations.

Upolu Point is the N.W. point of Hawaii. The land here falls in a gradual descent from the base of the mountains, and forms an extensive plain towards the water side, which seemed to be in a high state of cultivation, and abounds with native houses.

The *Kohala district* occupies the North part of Hawaii, and is divided from that of Waimea, to the southward, by a range of mountains. The soil on the leeward shore is barren from 3 to 5 miles inland. On the windward shore it is of good quality quite to the beach. The face of the country is regular, gradually ascending from the coast to the summit of the high lands. Kohala, or Kouala, is the principal place in the district, and there is an American Mission Station here.

There are soundings off the coast to the southward of Upolu Point. Vancouver anchored here about 7 miles from the point, in 41 fathoms, but drove off the bank in the night with a gust of wind from the land. On this account it is objectionable; it is exposed to the North winds, which, with those that blow from the N.W., are the most violent and dangerous known in this country.

Kawaihae Bay, *Towaihai*, *Towaiha* (Vancouver), & *Toe-yah-yah* (King), is 14 miles southward of Upolu Point. Captain King says this extensive bay is bounded to the North by two very conspicuous hills. Towards the bottom there is foul corally ground, but the soundings are regular, with good anchorage in 20 fathoms. Southward of the village a large patch of coral, dry at very low water, extends about half a mile off shore; its outer edge always breaks.

Light.—A fixed bright light is exhibited as a guide to the anchorage of Kawaihae; it is shown on the North side of the shallow channel leading to the pier, and is elevated about 50 ft. above the sea, and is visible 10 miles. With the light bearing E.N.E. there is good anchorage in 5 or 6 fathoms, about a quarter of a mile from the shore.

On approaching this bay from the westward, a conspicuous white tomb will be first seen appearing like a church steeple, then the white lighthouse, northward of which there is a deep valley. H.M.S. *Fantome* anchored in 9 fathoms, sand, about 4 cables from the shore, with the lighthouse bearing E. by N., the

tomb E. $\frac{1}{2}$ N., and the Morai N.E. by E. $\frac{1}{2}$ E. A red buoy is moored about 100 yards East of this position for the mail steamer.—*Lieut. Chamberé*, 1877.

Vancouver anchored in this bay February 14, 1793, and again on February 28, 1794, in 25 fathoms, on a bottom of fine brown sand and mud on the first visit, and on a stiff clay and good holding-ground on the second, the points of the bay bearing N. 36° W. and S. 31° W.; the Morai, which is also conspicuous in pointing out the station, N. 68° E.; and the watering-place at the distance of about $1\frac{1}{4}$ mile, being the nearest shore, S. 70° E. The *Morai*, or temple, is a conspicuous object, and a good leading mark into the anchorage; it stands on a barren eminence to the southward of the village, and is to be kept on a line with a small saddle hill, on the eastern land, descending from the higher parts, over the village of Toeaigh, on the North side of the bay. Its South point, descending gradually from Hualalāi, and forming a low point, bore by compass S. 31° W.; within this point, on the rising land, are some elevated hummocks; the third of these from the point, forming a kind of saddle hill in a line with a low, projecting, black, rocky point, in the middle of the bay, bearing S. 22° W., is a further direction, and a cross mark for this anchorage. On sounding round the ship, about a fourth of a mile to the S.W., a very small patch of coral rocks was found, where the water was only 10 fathoms in depth, but increased suddenly to 20 fathoms all around it. This was afterwards found to have only 3 fathoms in one part. On the opposite side, however, was clear, good anchorage for about a mile, where many vessels might ride without inconvenience from the bottom, though nevertheless exposed to the violence of the winds and sea between the limits above mentioned, comprehending 113° in the western quarter.

The shoal is a very great inconvenience to the roadstead, which is at best but a very indifferent one, being entirely exposed to the N.W. winds and the western oceanic swell, which beats with great violence on the reefs encompassing the shores. The only advantageous circumstances are the run of water, which, however, does not always flow, and the probability of procuring refreshments, from its contiguity to the populous and fertile western part of the Kohala district, and the plains of Waimea lying behind the land constituting the sea-coast.

The watering-place is in a small sandy bay, where, over a space of 20 yards of rugged rocks and stones, a fine stream empties itself, whose water is easily to be procured by landing the casks on the sandy beach.

Vancouver says:—"Toeaigh (Kawaihae) is situated in a grove of cocon-nut trees, just behind a sandy point. A reef of coral rocks, extending thence about three-quarters of a mile into the sea, rendered it inaccessible to our boats in a direct line, but we landed very commodiously in a narrow channel between the reef and the shore, near the Morai, to the S.E. of the beach. The village only consisted of straggling houses; in the centre of them was a reservoir of salt water, from which salt was made."

Capt. Wilkes says of this part:—The district of Waimea is situated on the N.W. side of the island. So much of the soil of this district as lies along the coast, though rich, is badly watered, and 7 or 8 miles in the interior from Kawaihae Bay it becomes exceedingly rocky and barren. The high land to the eastward of Kawaihae causes almost a perpetual calm. The mountain region is rocky, and has a burnt appearance, until the eastern side of the mountain is reached, when a dense forest and a most luxuriant vegetation succeed. The climate of this district is, upon the whole, unpleasant, particularly at Waimea, in consequence of the trade wind, which is exceeding strong, bringing with it a mist towards sunset. This wind rushes furiously down between the mountains which bound the valley of Waimea, and becomes very dangerous to shipping in the bay. It is called by the natives "Mumuku," and is foretold by them from an illuminated streak that is seen far inland. This is believed to be caused by the reflection of the twilight on the mist that always accompanies the Mumuku.

The productions of Waimea are the same as those of the other districts, but it also abounds in timber of good size and quality for building. This was the famous sandal-wood district, whence Kamehameha (the king) procured the cargoes he sold for the Canton market. Waimea was also the principal place of export for hides, tallow, and beef.

From the bottom of the bay the coast extends for about 28 miles in an irregular S.S.W. direction to the westernmost point of Hawaii, *Kaulano Point*. It does not appear to afford any shelter or interest to the mariner.

The great lava stream which flowed from the summit of Mauna Loa in January—July, 1869, reached the sea about 15 miles to the S.W. of Kawaihae, and considerably altered the features of the coast.

The S.W. side of the island is termed the district of *Kona* (or *Akona*), and includes Kealahakua and Kairua or Kailau. The district of Kailau is similar in character to that of Kealahakua, but the lava is of a more recent formation, the eruptions from Mauna Hualalai, in 1809 and 1810, having flowed down and covered nearly the whole northern portion. The mountain is 8,725 ft. high, and rises abruptly on its West side.

This being the lee side of the island, as explained in a former page, rain very seldom falls here, and this, with the absence of all dew, does not allow of much cultivation. There is coarse herbage enough for slight pasturage near the shore, but farther inland it becomes better, and the taro and bread-fruit are abundant. Land and sea breezes are very regular, and are the prevalent winds.

Kailua, *Kairua*, or, as it is called by Vancouver, *Tyachtatooa Bay*, is in this district, 3 miles from the West point. In Meures's account of Capt. Douglas's voyage, this bay is considered equal or superior to that of Kealahakua, but Vancouver's closer examination led him to a different conclusion. It is but a slight bend in the general line of coast, not more than 2 cables in depth, according to Capt. Duperry's chart, and scarcely deserving the name of a bay.

Vancouver anchored with the northernmost point bearing N. 69° W., by compass; the village, called Ane-oo-rooa, being the nearest shore, N. 30° E., about half a mile distant, and the point of Kowrooa (Kolui), S. 22° E. This was as close to the shore as prudence would allow them to lie, and the bottom in all directions appeared to consist of a mixture of rocks and sand. A considerable swell rolled in from the westward, and by the beaten appearance of the rocks which chiefly compose the shore, this seemed to be in general the case, and for that reason not a very eligible place for shipping. It has, however, one superiority over Kealakekua in respect of landing. This convenience is produced by the jutting out of two points; between these is a small cove, defended by some rocks lying before it, which break the violence of the surf, and render communication with the shore very commodious. The landing is on a sandy beach, before a grove of cocoa-nut, bread-fruit, and other trees, in the midst of which the village is situated. On a point on the West side is the tomb of King Kamehameha, which is placed by Duperrey in lat. 19° 37' 20" N., long. 156° 1' W.; later observations place it in 156° 4' 20" W. Toward the South part of this cove is a spring, which rose very rapidly from amongst some rocks which are generally covered with the sea water; but when this is low, which is sometimes the case, it is found to produce a stream of excellent fresh water; by proper means there is no doubt but that it might be made available for the neighbourhood and shipping.

Kairua Bay may be recognised from seaward by its two churches and by the cocoa-nut groves westward of the bay. Mauna Huarari, bearing N.E. by E., will lead to it.—*Lieut. Lloyd, H.M.S. Tenedos.*

The next district, or rather portion of the district of Kona, is that of Kealakekua, or Karakakooa, which lies southward of the preceding. Wilkes describes it thus:—"Almost the whole coast of this district, extending 40 miles, is one line of lava. This frequently lies in large masses for miles in extent, and is in others partially broken, exhibiting perpendicular cliffs, against which the sea dashes with fury. This formation extends half a mile into the interior, and as the distance from the sea increases, the soil becomes richer and more productive. The face of the country, even within this rocky barrier, is rough, and covered with blocks and beds of lava, more or less decomposed. The land in places reaches the altitude of 2,000 ft., and at the distance of 2 miles from the coast begins to be well covered with woods of various kinds of trees, which are almost rendered impassable by an undergrowth of vines and ferns. In these woods there are many cleared spots, which have the appearance of having been formerly cultivated, or having been burnt by the descending streams of lava. In some places these strips of wood descend to within a mile of the shore, having escaped destruction. These are in no place parallel to the shore, but lie always in the direction which the streams of lava would take in descending from the mountains. Cultivation is carried on; the only staple commodities

at present are sweet potatoes, upland taro, and yams, the latter almost entirely raised for ships."

The climate is mild throughout the district, and there are seldom strong winds. From May to September, the wet or rainy season, there is a good deal of rain. In December, January, and February, the weather is usually very dry, and the winds prevail from the North, from which quarter it sometimes blows fresh.

Kealakekua or Karakakooa Bay, 13 miles S. by E. $\frac{1}{2}$ E. from Kailua, derived a sad celebrity from being the scene of the death of the immortal Capt. Cook, the discoverer of the group, and the father of modern hydrography.

According to Capt. King, and the sketches by Lieut. Child, R.N., 1875, and Lieut. Chambré, H.M.S. *Pantome*, 1876, the bay is about a mile in depth, and lies between two low points of land, $1\frac{1}{2}$ mile apart, N.N.W. and S.S.E., the northern named Lava Point, and the southern Keei Point. On the North side, which is flat and barren, stands the village of Kowrowra or Kaavolou; and in the bottom of the bay, near a grove of tall cocoa-nut trees, there is another village of more considerable size, called Kakooa; between them runs a rocky cliff, 400 to 600 ft. high, inaccessible from the sea-shore. On the South side the coast, for about a mile inland, has a rugged appearance; beyond which the country rises with a gradual ascent, and is overspread with cultivated enclosures and groves of cocoa-nut trees, where the habitations of the natives are scattered in great numbers. The shore all round the bay is covered with a black coral rock, which makes the landing very dangerous in rough weather; except at the village of Kakooa, where there is a fine sandy beach, with a morai, or burying-place, at one extremity, and a small well of fresh water at the other. This bay appearing to Captain Cook a proper place to refit the ships and lay in an additional supply of water and provisions, he moored on the North side, about a quarter of a mile from the shore, Kowrowra bearing N.W.

Kaavolou Cove, in the N.W. part of the bay, although exposed to winds from the South and S.W., may be considered a safe anchorage, except during the winter months. Cook Point, which lies three-quarters of a mile eastward of Lava Point, and forms the South point of the cove, partially protecting it from the swell. Cook's monument stands on the shore, about 1 cable North of Cook Point. A fixed bright light is exhibited on Cook Point when the mail steamer is expected. Between Cook Point and Peterel Point, three-quarters of a mile to E.S.E., there are depths of 30, 25, and 10 fathoms water, bottom chiefly of sand and shells; in the vicinity of Peterel Point, however, the bottom is rocky.

Large vessels usually anchor in the middle of the bay, in 25 fathoms, sand, with Cook's monument bearing N.W., and Keei Point S. $\frac{1}{2}$ E. H.M.S. *Pantome* anchored in Kaavolou Cove, in 30 fathoms, abreast Cook's monument, mooring with a stern hawser to the shore, and during her stay of six weeks (in October

and November) southerly winds were experienced only on two occasions, when a disagreeable swell set in, although the winds were light; landing, however, was not interrupted. The best landing-place is about half a cable southward of Cook's monument, whence there is a good road leading to Kona.

Beef, fowls, sweet potatoes, and plantains can be obtained in Karakakoa, also water at Naipupu, on the S.E. side of the bay, but the tank is falling into decay, and the water is brackish in all the wells in the vicinity of the cove.

The summit of Mauna Loa, bearing E. $\frac{1}{2}$ N., will lead to Karakakoa Bay; this summit has a smooth appearance, while that of Mauna Kea has a rugged appearance.—*Lieut. Lloyd, H.M.S. Tenedos.*

The last words of the illustrious circumnavigator's journal refer to this place:—

"At 11 a.m. (Sunday, January 17, 1779,) we anchored in the bay which is called by the natives *Karakakoa*, in 13 fathoms water, over a sandy bottom, and about a quarter of a mile from the N.E. shore. In this situation the South point of the bay bore S. by W., and the North point W. $\frac{1}{2}$ N. We moored with the stream anchor and cable to the northward, unbent the sails, and struck the yards and topmast. The ships continued to be much crowded with natives, and were surrounded by a multitude of canoes. I had nowhere in the course of my voyages seen so numerous a body of people assembled at one place; for, besides those who had come off to us in canoes, all the shore of the bay was covered with spectators, and many hundreds were swimming round the ship like shoals of fish. We could not but be struck with the singularity of this scene; and perhaps there were few on board who now lamented our having failed in our endeavours to find a northern passage homeward last summer. To this disappointment we owed our having it in our power to revisit the Sandwich Islands, and to enrich our voyage with a discovery which, though the last, seemed in many respects to be the most important that had been made by Europeans throughout the extent of the Pacific Ocean."

The subsequent proceedings of the discovery ships are familiar to most. Capt. Cook on his landing was received by the natives in a most extraordinary manner. He received unmistakable evidences of adoration addressed to him, and several religious ceremonies occurred, in which he was the principal object. The most unbounded liberality was also shown to the visitors, and all was friendly and respectful. The ships quitted the bay on the 4th of February, but on one of them springing her foremast, they determined to return, and reached their former anchorage on the 11th following. Their reception was the reverse of what was anticipated, and suspicion and aggression in small matters took the place of the former good feeling. This led to open outbreak, and on Sunday, February 14, 1779, Cook landed with a boat's crew, in the midst of an immense and armed crowd. A chief had been unfortunately shot, and the news arriving, was the signal for open warfare, and Cook was stabbed in the back in attempting to reach the boat at the water's edge. Thus died

this most remarkable man at the scene of his most important discovery. The stone on which he landed is still shown, and the stem of a tree, near to the spot where he fell, was marked with an inscription on copper relating the fact, now replaced by a monument, erected in 1874. The top of this tree has been brought to England, and deposited at Greenwich hospital.*

The name of the bay, Karakakooa, as Cook calls it, or Kealakekua, according to the missionary orthography, signifies "the path of the gods," and is so termed from a slide in the hill, still visible, by which the natives believed the gods used to cross the bay quickly.

The bay is not extensive, and opens between two low and barren hills, on each of which stands a town. Between them a high perpendicular bluff rises directly from the water, in which are numerous caves formerly and still sometimes used as places of burial. These caves are nearly inaccessible, and resorted to by vast flocks of birds.

The district of *Kau* occupies the southern extremity of the island. The coast, says Capt. King, presents a prospect of the most horrid and dreary kind, the whole country appearing to have undergone a total change from the effects of some dreadful convulsion. The ground is everywhere covered with cinders, and intersected in many places with black streaks, which seem to mark the course of a lava stream which flowed, not many ages back, from the mountain Roa to the shore. The southern promontory looks like the mere dregs of a volcano. The projecting headland is composed of broken and craggy rocks, piled irregularly on one another, and terminating in sharp points.

Notwithstanding the dismal aspect of this part of the island, it is much more populous than the verdant mountains of Puna to the N.E. Nor is this circumstance hard to be accounted for; the natives prefer such ground as lies more convenient for fishing, or is best suited to the cultivation of yams, and plantains. Now, amid these ruins there are many patches of rich soil, which are carefully cultivated, and the neighbouring sea abounds with excellent fish. Another inducement for their residence here is that it is the *fungus district*,

* The fate of Cook is a sad evidence of an unfortunate point in his personal character. His temper was overbearing and hasty, and for this his attached friend and companion, Captain King, remarks, he might have been justly blamed. No other navigator ever experienced such a welcome. He was the god to them which tradition led them to expect to return, and *Lono* (O-rono), as he was called, received divine honours and unbounded liberality. Unfortunately they did not meet with due consideration, and he who was considered immortal was killed. All his remains were not returned at the time, but his ribs and breast-bone, as also a sledge from the N.W. coast of America, were afterwards worshipped by those who believed in his divinity. They were preserved in a small wicker basket, covered with red feathers, and deposited in a temple dedicated to Lono, on the East side of the island. They were annually carried in procession to other parts of the island. Their fate has never been properly ascertained, but it is said that some of them were brought to England by Lihō-Lihō. The remainder have probably been hidden since idolatry was abolished.

where this vegetable production is collected and dried for the China market, and is sent to Honolulu for shipment in large bales. Off this part of the coast Capt. King could find no ground at less than a cable's length off the shore, with 160 fathoms of line, excepting in a bight to the eastward of the South point, where they had regular soundings of 50 and 58 fathoms, over a bottom of fine sand.

Ka Lae, the South point, is in lat. $18^{\circ} 54'$, long. $155^{\circ} 42'$, and on it stands a tolerably large village. After Cook's visit it was reported that good anchorage and excellent shelter existed close round on the western side of this South point, and had been overlooked by that navigator; but Vancouver, to set the matter at rest, examined it, and found that the shores were nearly straight, and exposed to a tremendous surf, which broke with such fury as to render landing, if not impossible, highly dangerous, even to those inhabitants who are most expert in the management of their canoes.

The whole of the S.E. side between the South point and Kapoho Point, a distance of 60 miles, affords not the smallest shelter or anchorage of any description. All this part of the island has been much altered by the effects of the volcano which stands over it.*

MAUI, or *Mowee* of the older navigators, is the next large island to the N.W., *Alenuihaha Channel*, between them, being $23\frac{1}{2}$ miles in width. It is 43 miles in length, W. by N. and E. by S., with a greatest breadth of 23 miles; at a distance it appears like two islands, but a nearer approach shows the low sandy isthmus only a few feet above the sea, and 6 miles across, uniting the two peninsulas. The whole island, like all the rest of the group, is volcanic, and appears to have been produced by the two adjacent volcanos, which have ejected the enormous masses of matter of which it is composed. The island resembles Tahiti more than Hawaii does, both in form and appearance. The lofty summits of the southern peninsula are never covered with snow, though they are often seen above the clouds. The high land is steep and rugged,

* The southern extremity of Hawaii suffered most from the great eruption of Mauna Loa, of 1868, alluded to on page 1068. It commenced, with but few warnings, on March 27th, and from that period to April 10th it was estimated that two thousand shocks were felt, the heaviest on April 2nd, which was felt in Honolulu, and destroyed every church and dwelling in the Kau or southern district of Hawaii. On April 7th, a new crater suddenly burst out on the side of the mountain, near a house, which was covered with lava ten minutes afterwards, and from it a river of fire, varying from 500 to 1,200 or 1,500 feet wide, ran southward at the rate of 10 miles an hour. This lava stream reached the South point, and the *Kona* packet, passing this point at the time, it is said at 3 miles distance (probably exaggerated), saw a conical island, 400 feet high, rise out of the sea midway between the land and the vessel, the mud bespattering her sails. The lava flowed down to this island, so that it now joins the land. The whole of this Kau district was desolated, and much loss of life ensued, so that it is now almost deserted.

showing at all times the igneous nature of its formation, extinct craters and indurated lava streams. Where this has decomposed, the sides of the mountains are covered with shrubs and trees.

The surface of the northern peninsula does not appear to be of such recent formation as that of the southern, and although it is of evident volcanic formation, the marks of recent eruption are seldom seen.

The aspect of the two portions of Maui are very distinct from each other. East Maui chiefly consists of *Mauna Haleakala* ("house of the sun"), which, from perpendicular cliffs near the sea, rises in many parts with one unbroken slope to the summit, 10,030 ft. high, somewhat resembling Mauna Kea, on Hawaii. West Maui is very much intersected by sharp peaks and ridges, separated by deep valleys which form sloping plains of considerable extent to the northward and southward. The highest peak of West Maui is *Mauna o Ekeka*, 6,130 ft. high, and the greater part of this peninsula is grazing land.

Mauna Haleakala has the largest known crater in the world, or it may be that it is formed of several craters. The mountain is 10,030 ft. high, and the crater measures over 20 miles around its edges, and is 2 miles across its widest part. The summit is bare. At the height of 8,000 ft. there is a large cavern. Capt. Wilkes says:—"The crater of Haleakala, if so it may be called, is a deep gorge, open at the North and East, forming a kind of elbow; the bottom of it, as ascertained by the barometer, was 2,783 ft. below the summit peak. Although its sides are steep, yet a descent is practicable at almost any part of it. The inside of the crater was entirely bare of vegetation, and from its bottom arose some large hills of scoria and sand. Some of the latter are of an ochre-red colour at the summit, with small craters in the centre. All bore the appearance of volcanic action, but the natives have no tradition of an eruption."

The isthmus is, as before stated, very low, and consists of sand constantly shifting, and thrown up into "dunes." It is too dry for cultivation, and is about 20 by 15 miles in extent. For nine months of the year it is a fine grazing country, and feeds large herds of cattle.

East Maui, though mountainous, has most cultivated land, and the rich volcanic soil of the Kula District on the S.W. side of the island raises abundant crops of potatoes, which are sent to supply the whalers and other ships. Wheat and other grain is also cultivated, and increasing. Maui is also the principal island for the growth of sugar.

The South point of Maui, *Cape Kahiki*, or *Hanamanioa*, is formed by rugged, craggy rocks, and the sea breaks at a little distance to the N.W. of it. The edge of this bank is very steep-to, suddenly shoaling from no bottom with 80 fathoms to 25 fathoms, and then to 10 fathoms. The South side of the island terminates very abruptly in the ocean, and, though rugged, is verdant and fertile.

At $1\frac{1}{2}$ mile southward of *Kauiki Head*, the East extreme of Maui, is *Alau Islet*, close to the shore. In 1883, Commander Clark, H.M.S. *Sappho*, re-

ported that a sunken rock, with about 8 ft. on it at low water, lies with Kauiki Head bearing N. 32° W., and the West extreme of Alau N. 62° W. A reef extends about half a mile S.E. of Alau, and other patches of 3 to 5 fathoms lie about 2 cables to the South and West.

The North coast of East Maui is a succession of deep ravines running up the mountains, and down them cascades, several hundred feet in height, but with little volume of water, are to be seen falling. In this respect it resembles the windward side of Hawaii. This circumstance renders travelling along the coast very difficult.

The East end of West Maui is an abrupt precipice, several hundred feet high on the coast. On the S.E. part of it is a female seminary, of some celebrity, called *Wailuku*. It is an extensive range of coral and adobe buildings in a flourishing village, and is one of the best organised establishments in the Sandwich Islands. We have few nautical particulars of the northern portions of Maui.

Kahului Harbour.—About $2\frac{1}{2}$ miles south-eastward of Wailuku is Kahului, and in the neighbourhood of both these places are some large sugar plantations. There is a railway between Wailuku and Kahului, and another line extends 7 or 8 miles eastward from Kahului to the large Haiku plantations.

Kahului Harbour is formed by an opening in the extensive coral reefs which here line the coast, and is only about a quarter of a mile wide between the breakers, affording anchorage in 7 or 8 fathoms, within 1 cable to the W.S.W. of the beacon marking the eastern reef, and about 3 cables off shore. There is a wharf and custom-house here, and a pier is being built over the reef. Pilots may be had. Hobron's flagstaff, on the East point of the harbour, is in lat. $20^{\circ} 54' 15''$ N., long. $156^{\circ} 27' 49''$ W. It is high water, on full and change, at $11^h 40^m$; springs rise 3 to 4 ft.

Lahaina, on the S.W. side of West Maui, was for a considerable time the residence of the king. After Kamehameha had conquered the group in 1795, the year after Vancouver's visit, he removed the seat of government to Honolulu, Oahu; but his successor found this too troublesome a site from the importunities and assumptions of the white residents and white visitors. Lahaina was therefore selected as the most central position of the archipelago. The first missionaries were planted here in May, 1823.

The town of Lahaina is built along the beach for a distance of three-quarters of a mile; it is principally composed of grass houses, and has one principal street, with a few others running at right angles. After the governor's (or king's) palace the fort is the most prominent object; its form is quadrangular, the longest side facing the sea; it is of little account, however, as a defence, serving chiefly to confine unruly subjects and sailors in. The area within is about an acre, and the walls are 20 ft. high. According to the observations of the United States' Exploring Expedition, it is in lat. $20^{\circ} 51' 50''$; long. $156^{\circ} 41'$.

The tide here is irregular, being somewhat dependent on the winds; it runs to the N.W. generally, sixteen hours out of the twenty-four.

The seminary of Lahainaluna is the most remarkable building to be seen as the bay is approached. It stands on the side of the mountain behind the town, and 2 miles from it. It was founded in 1831, for instructing school-teachers. An excellent chart of the Sandwich Islands was engraved, on small pieces of copper taken from a wreck, at this establishment, a singular production for this remote spot.

Lahaina is in some points a preferable place to Honolulu for refreshment; more order reigns here than in most places in the Pacific; and the absence of foreigners and their attendant grog-shops, causes less temptation to be thrown in the way of crews ashore. Provisions, especially potatoes, are abundant. In the neighbourhood is one of the best sugar plantations in the islands, but rain falls so seldom that every acre has to be irrigated.

Lahaina was a favourite recruiting place for the whale ships, and consequently the products of the other islands were brought here, and everything may be got here except taro. The fruits are excellent. There are several European residents and traders. The island seems to be rising as the beach is extending, having advanced at least 20 ft. since 1855.

Light.—A *fixed bright light*, visible 6 miles, is shown on the beach.

As the shoals on the N.W. side of Maui extend a considerable distance from the shore, vessels bound for Lahaina roadstead should not approach the land to the northward of it nearer than 3 miles until the lighthouse bears N.E. $\frac{1}{2}$ N., when a good berth will be found in 10 to 15 fathoms, sand, with the lighthouse on that bearing. Two lights horizontal, about 4 ft. apart, are exhibited from the lighthouse, but they cannot be distinguished as two separate lights until within $1\frac{1}{2}$ mile of the anchorage. The landing-place is at a small pier extending from the lighthouse, and protected by a breakwater.—*Lieut. Child, H.M.S. Peterel, 1875.*

Notwithstanding that the anchorage on this side of Maui is well sheltered, Vancouver considered that the bottom was only a slight covering of sand over a bed of hard coral. The lead does not discover this, but on anchoring the deceitfulness of the bottom is manifest. The roadstead of Lahaina is only an open one; the shores are bounded by a reef, with only one landing for boats. The soundings decrease regularly to 5 fathoms close to the reef, extending in general about one-fourth of a mile from the beach. The West extremity of Maui forms, with the West point of the roadstead bearing N. 14° W. and S. 14° E., 3 miles asunder, an excellent little bay. The North point is formed by a round hill close to the water side.

The southern side of West Maui has a forbidding aspect; the shores, however, are not so steep and rocky as elsewhere, and have generally a sandy beach. There is a roadstead here, called by Vancouver *Patoa*, which is represented as a good anchorage, and may be easily found by attending to the following

description:—The large bay, formed by the two peninsulas and the sandy isthmus, has its western side formed by high rocky precipices, that rise perpendicularly from the sea. To the westward of these precipices the coast is chiefly composed of sandy benches, and the mountains, at some distance from the shore, form two remarkable valleys, separated from each other by a high rugged mountain, seemingly detached from the rest, and approaching nearer to the beach than those to the right and left of it. The anchorage at Patoa is abreast of the easternmost of these valleys, which appeared fruitful and well cultivated.

The western side of this large bay (*Kamalaea Bay*) is formed by rocky cliffs and precipices; its opposite shore is about 4 miles distant; the soundings on the eastern side are regular, but very rocky. Nearly in the middle of its western side is a village, called Mackerrey by Vancouver, off which there is anchorage in 7 fathoms, a little more than a quarter of a mile off shore, bottom of sand and broken coral. It is only open to about two points to the S.W., but there is not much wind from that quarter; one great inconvenience attending the anchoring in any part of this bay is the violent squalls which blow over the isthmus. These gusts, or rather gales of wind, blow constantly when the trade wind blows fresh at sea, and especially when it is most from the northern quarter. At these times it prevents any communication with the shore, and this is the more serious, as the holding-ground is treacherous.

Kamalaea Bay is the seaport for the towns of Wailuku and Waikupu, distant 6 and 4 miles respectively from the landing-place, which is at a pier in the northern part of the bay, the channel leading to the landing-place being about 20 yards wide, between two coral reefs. The anchorage is in the N.E. part of the bay, in 13 to 8 fathoms, sandy bottom; a spar buoy is moored in 6 fathoms near this anchorage, and should be kept well on the starboard bow on entering the bay. H.M.S. *Peterel* anchored in 9 fathoms with the pier-head bearing N. by W. $\frac{3}{4}$ W.; the spar buoy, N. by E. $\frac{3}{4}$ E.; and the West point of the bay, S.W. by W. $\frac{1}{4}$ W.—*Lieut. Child.*

Makena, or *Makee's Landing*, a small indentation near the South extreme of Maui, derives its name from a planter, whose estate is situated about 5 miles East of the landing-place. It may be recognised from seaward by Round Hill, 500 ft. high, with a flagstaff on its summit, situated on a point about a mile South of the landing; on a nearer approach the stone church, and several houses near the landing, will be seen.

The anchorage is in 10 to 12 fathoms, sand, about 3 cables from the landing-place, with Round Hill flagstaff bearing S. by W. $\frac{3}{4}$ W.; the Landing-shed on the beach, E. by N. $\frac{3}{4}$ N.; and the North extremes of Molokini Islet and Kahului Island in line, W. by S. $\frac{3}{4}$ S.; the depths gradually decreasing to 3 fathoms near the shore. Off the landing-place are two mooring buoys for the trading schooners, lying in 5 and 8 fathoms. This anchorage is exposed to the

North Pacific.

heavy squalls which occasionally blow over the low isthmus near the centre of Maui; and landing in ships' boats is at times impracticable.

According to Lieut. Clapp, H.M.S. *Scout*, the North point of the roadstead is in lat. $20^{\circ} 39' N.$, long. $156^{\circ} 28' W.$ It is high water, on full and change, at about 1^h; springs rise about 5 ft.

Another anchoring-place will be found near the S.W. point of East Maui, a little to the southward of the remarkable Round Hill on a sandy beach, projecting its rocky base into the sea. From the appearance of its summit it was called Volcano Hill; it lies N. $26^{\circ} W.$, about 3 miles from the South point of Maui, and directly opposite the island of Molokini. The soundings are regular, from 7 to 15 and 25 fathoms. The beach appears convenient for landing on, but there is no water.

MOLOKINI, *Morokini*, or *Morrotinnee*, is a barren rock, lying in *Alala-keiki Channel*, which separates East Maui from Kahulauai. It is high, or it would be dangerous to shipping. It is only visited by fishermen, who dry their nets on its barren surface.

KAHULAUAI (*Kahoolawe*, *Tahaurawe*, *Tahoorowa*, or *Kudoolawe*), lies $5\frac{1}{2}$ miles off the S.W. point of Maui, and from its shape and appearance seems as if it once formed a part of that island, and had been detached by some convulsion. It is low, and almost destitute of every kind of verdure or shrub, excepting a species of coarse grass. There are no evidences of active volcanic agency.

It is $12\frac{1}{2}$ miles long, N.E. by N. and S.W. by S., and 5 miles wide. It is only inhabited at times by a few poor fishermen, and was used as a place of exile; it is now chiefly useful as a sheep pasture. The whole South part is covered with a light soil, consisting of decomposed lava, and destitute of vegetation. On the North side there is a better soil, capable in some places of vegetation, and here there are one or two houses. Off the West point of the island, *Cape Kealaikahiki*, is a detached shoal, seen by Cook on his discovery of the island, February 24, 1779. It lies $1\frac{1}{2}$ mile off the point, and has 9 ft. water on it. Vessels may pass safely within 2 miles of the point, but it will be much better not to approach within 3 miles. This shoal is the one of the very few hidden from the navigator around the Sandwich Islands.

LANAI or *Ranai* lies 7 miles to the West of West Maui, the channel between being named *Auau*, and 16 miles to the N.W. of Kahulauai, the space between being called *Kealaikahiki Channel*. Lanai is a dome-shaped island, 16 miles in length, E.S.E. and W.N.W., and 4 to 10 miles in width, higher than Kahulauai, but neither so high nor broken as any of the other islands, its greatest altitude being about 3,000 ft. The greater portion of it is barren, and the island in general suffers from the long droughts which frequently prevail; the ravines and glens, notwithstanding, are filled with thickets of small trees, which serve useful building purposes to the natives of Maui. Like the rest of the group, it is volcanic; the soil is hollow, and by no means fertile; the shores

abound with shell-fish, medusæ, and cuttle-fish. The inhabitants are about 400 in number, and numerous sheep are kept on the island. The country to the South is high and craggy; it appears to have been frequently rent, large fissures being apparent on its sides. The other parts of the island have a better aspect.

MOLOKAI or *Morotoi* lies 7 miles North of Lanai, the channel between being named *Pailolo*. It is a long, irregular island, apparently formed by a chain of volcanic mountains, 35 miles in length, E. by N. and W. by S., and only $2\frac{1}{2}$ to 9 miles broad. The mountains are nearly equal in elevation to those of Maui, and are broken by numerous deep ravines and water-courses, the sides of which are frequently clothed with verdure, and ornamented with shrubs and trees. There is but little level land in Molokai, and consequently but few plantations; several spots, however, are fertile, and repay the toil of their cultivators.

One-third of the island to the West is a barren waste, and has but few inhabitants. The remainder, to the East, is almost one entire mountain, rising gradually from the South to the height of 2,500 ft.; while to the North it is almost perpendicular. On the South side there is a narrow strip of land, not exceeding one-fourth of a mile wide, the soil of which is very rich, and which contains the greater part of the population. The soil here, however, is too dry for cultivation, which is carried on in the uplands. The people are very poor, and ill-provided with necessaries. In 1832 their number was 6,000; in 1840 only 5,000, and this was reduced to less than 2,000 in 1884; at the first-named period it was first occupied as a missionary station.

There are several small harbours within the reef on the South side, near *Kaluaaha*, the missionary station, which are capable of sheltering vessels of 60 to 80 tons. The following particulars concerning Kaunakakai and Kalanoo are by Lieut. Child, H.M.S. *Peterel*, 1875.

Kaunakakai is situated about the centre of the southern side of Molokai, and from it the West extreme of Lanai bears South. Here there is an outer and inner anchorage; the former is not good, owing to the unevenness of the bottom, and the latter affords but a limited space; there is said to be not less than 4 fathoms over the bar leading to the inner anchorage, and 5 to 7 fathoms within. Two posts on the shore form a leading mark, and a red buoy is moored in 5 fathoms within the bar, for the mail steamer. Vessels approaching should bring the posts in line, and anchor in 10 to 13 fathoms, rock and sand; this mark also leads in mid-channel to the inner anchorage. On each post is a lantern, from which lights are exhibited when the mail steamer is expected.

Quail and pheasants are to be shot (with permission from the Government at Honolulu), but no other supplies can be obtained here.

The South coast of Molokai should not be approached at night without local knowledge, as the reef which fringes the South shore of the island is steep-to, and extends seaward in some places to a distance of 3 miles.

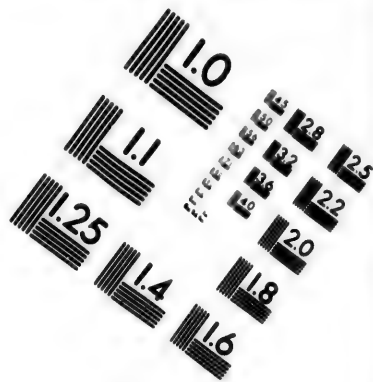
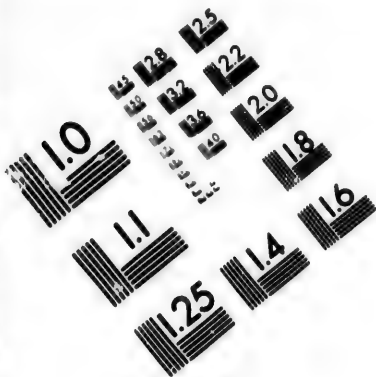
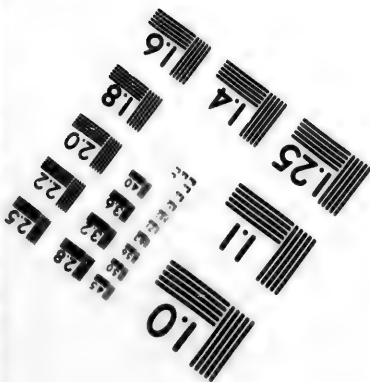
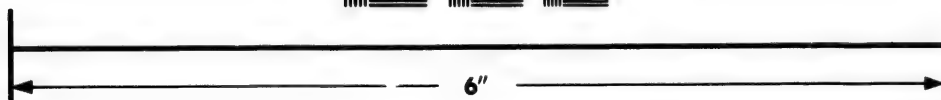
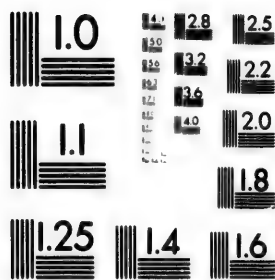


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Kalauao is situated near the centre of the North coast of Molokai. The anchorage is to the southward of a long, low point, extending from the foot of two steep remarkable mountains; it cannot, however, be considered safe, being exposed to the prevailing trade wind, and the heavy swell which occasionally sets in. The best anchorage is in 13 fathoms, sand, with the church bearing E. $\frac{1}{2}$ N., and the North point N. $\frac{1}{2}$ E. A red buoy for the mail steamer is moored in 13 fathoms, with the church bearing East. Landing at Kalauao, always difficult, is at times dangerous, and no supplies can be obtained. This is the port for communication with the leper settlement, people afflicted with that disease being sent here from the other islands for isolation.

Sir Edward Belcher, R.N., says:—Passing the East end of Maui, and coming suddenly on Molokai, the view is very singular; four exactly parallel outlines of picturesque and lofty cliffs appear almost a visual deception, or the effect of quadruple refraction; but on advancing it will prove to be a reality; their height is about 400 ft., and varying but slightly from the perpendicular. Here, also, as on Maui, several very pretty but loftier cascades embellish the scenery, which, attired in nature's clothing only, is rich in colours.

The East point of the island is called *Halawa Point*; and about three-quarters of a mile off its South side is a small, barren, rocky islet, called *Mokuo Niki*, or *Moduene*. Off the N.W. end of the island a small bay was observed by Cook; but it was found by Vancouver that the space indicated was nearly a straight shore, composed alternately of rugged rocks and sandy beaches. He anchored in 19 fathoms, within about a mile of the breakers, on a fine sandy bottom; the West point of the island bore South by compass, distant 4 miles, and the N.W. point N. 26° E., about the same distance. This was as close as safety would allow, but it is entirely exposed to the North and N.W. winds, which frequently blow with great violence, and to the very heavy roll of the sea.

Light.—On *Lae o ka Laau Point*, the western point of Molokai, is a white lighthouse, showing a *fixed bright* light, elevated 50 ft., and visible 11 miles. Lat. $21^{\circ} 6' N.$, long. $157^{\circ} 19' W.$

OAHU, or *Woahoo*, the next island in succession, is divided from Molokai by *Kaiei Channel*, 22 miles in width. It may be looked on as the principal of the group, as regards maritime affairs, inasmuch as it contains the port chiefly frequented by the shipping of the North Pacific. The island is 40 miles long, W. by N. $\frac{1}{2}$ N. and E. by S. $\frac{1}{2}$ S., by 21 miles in greatest breadth. Like the rest of the islands, it is of volcanic formation; Captain Cook only saw the North or *windward* side, and, judging from this alone, it appeared to him to be by far the finest island of the group. "Nothing could exceed the verdure of the hills, the variety of wood and lawn, and rich cultivated valleys, which the whole face of the country displayed." A different conclusion was arrived at by Capt. Wilkes, who came first upon the lee side. "The appear-

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ance of Oahu is by no means inviting; it has a greater resemblance to the desert coast of Peru than any other of the Polynesian islands we had visited, and has as little appearance of cultivation. The country, at first sight, would be termed barren and rocky." There could not be a better example of perfectly opposite characters applied to the same place than this, nor a better evidence of the great variation in climate which may occur within a very short distance. But whatever may be said of the unpromising appearance of its southern side, there is no doubt that it is the garden of the Sandwich Islands.

The East end of the island is called *Cape Makapua*. There are numerous caves here, situated in a bluff of 300 ft. elevation, their mouths at about two-thirds the height. They are the effect of volcanic action, and have been, and are still sometimes used as burial-places. At 9 miles north-westward of this point is the peninsula of *Mokapu*, forming the harbour of *Waialai*, the entrance of which has only 9 ft. water, a depth only fitting for the island vessels. Opposite to it inland is *Kaneote*, the mission station for the North side of the island, in the district of Pali Kulau. This district contains about 4,500 inhabitants, and the productions are similar to the island generally. Sugar and coffee are grown. There is a belt of arable land, only a few feet above the sea, extending along this district, which increases in breadth to the westward. This narrow strip of land, varying from half a mile to 2 miles in width towards the North end, is called the Kulauloa district. It is bounded by the mountain chain of Konohaunui, and from its position it receives abundance of rain for agricultural purposes. There are several small streams, which will drive the machinery for sugar-mills. The scenery of this part is most enchanting for beauty, boldness, and variety; stupendous precipices, rising some 2,000 or 3,000 ft., with numerous small streams gushing down their sides.

The district of Waialua stretches from *Kaena Point*, the most westerly cape of Oahu, to Waimea, in the district of Kulauloa, on the N.E., and to Waianae, on the S.W., a distance along the coast of above 20 miles. Within this district are a few bays for vessels not exceeding 150 tons burthen; the best of these is Kawailoa. Those to the N.E. are Waimea, Haua, Kakaun, Moluilui, and Makua. Part of this district produces abundantly, being cultivated by irrigation. Five considerable streams water it from the Konohaunui range, passing down the fertile valleys.

As just stated, the sugar-cane has been increasingly cultivated. The following notes were made on a visit to the plantations in 1865:—

Passing by the two plantations in Nuuanu Valley, located within sight of Hono-lulu, we reached the *pali* (or cliff) over a good dry road, which here is seldom found in winter, and encountering a cool bracing North wind, which came rushing through the narrow gap and down the valley as if it had been engaged up an hour or two by the encircling mountains. What a scene opens here to the traveller, as he commences the descent of the precipice—a plain 25

miles long, intersected with ridges of low hills, and hemmed in on the *mauka* side by bold palisades, in some places 2,000 ft. perpendicular.

Once down the *pali*, the traveller finds himself in Koolau, which embraces all the windward side of this island, East of the summit ridge, and extending from Waimanalo at the South to Waimea at the North, a tract about 50 miles in length, and varying from 1 to 5 miles in width. All this district of Koolau is exposed to frequent showers, and is intersected with numerous small streams, which tend to make it valuable for agriculture and pasturage.

Between the foot of the *pali* and the Protestant church at *Kaneohe* lies the sugar estate of the Queen Dowager Kalama. Just beyond Kaneohe is a tract of 3,000 acres, called *Hesia*, where the Roman Catholic church is located, which is probably well calculated for a sugar plantation.

Beyond is the *Kaalaea* plantation, extending from the sea back to the central mountain range. The estate comprises some 2,000 acres, 800 acres of it being suitable for cane. At 3 or 4 miles beyond Kaalaea we come to the *Kuolaa* estate, now called the "Oahu Plantation;" including Kaawa, it consists of about 4,000 acres.

Like much of the land on this side of Oahu, the cane-fields here consist of rich bottom-land, lying just above the level of high tide. So near the surface is the water, that the roots of the cane find moisture all the year round, reducing the risk of drought very much. The soil, like that of Lahaina, Waikapu, and Wailuku, receives its deposits of rich alluvium from the mountains in the rear.

Waimea Bay, or *Whymea* as Captain King calls it, was visited by the *Resolution* and *Discovery* in February, 1779; they anchored in 13 fathoms, sandy bottom, the extreme points of the bay bearing S.W. by W. $\frac{1}{4}$ W. and N.E. by E. $\frac{1}{4}$ E., off the mouth of a fine river, running through a deep valley. Watering here, however, could not be well effected on account of a reef which stretches along shore to the distance of half a mile.

At *Kawailoa* the coast forms a small bay, and has a dreary aspect on first landing. The soil is sandy and poor, and the people had a squalid and miserable appearance, but at a short distance inland a great and pleasing change is seen. It was near here that Mr. Gooch, the astronomer to Vancouver's expedition, and Lieut. Hergest, were killed by the natives.

Kaena Point is the western cape of Oahu, and from hence the western coast of Oahu trends S.E. $\frac{1}{4}$ S., 20 miles, to *Laesla* or *Barber Point*, the S.W. point. It is composed principally of steep, craggy mountains, some descending abruptly into the sea, others terminating at a small distance from it, whence a low border of land extends to the sea-shore, formed by sandy beaches, chiefly bounded by rocks, over which the surf beats with great violence. Vancouver says, nearly in the middle of this side of the island is the only village he had seen westward of Opooroah (the Pearl lagoon). In its neighbourhood the bases of the mountains retire farther from the shore, and a narrow fertile valley

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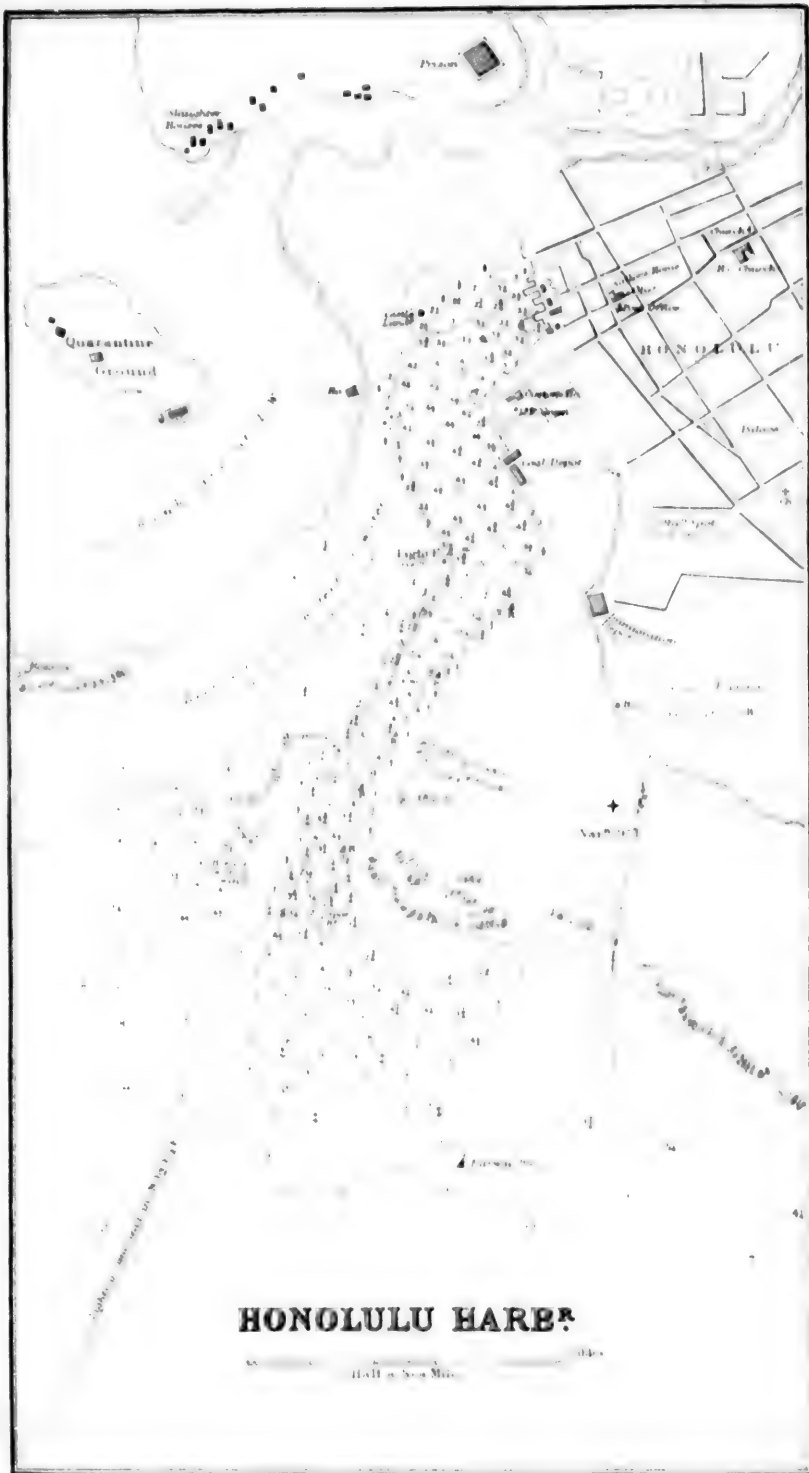
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winds through the hills. The shore here forms a small sandy bay. On its South side, between two high rocky precipices, in a grove of cocoa-nut and other trees, stands the village; and in the centre of the bay, about a mile to the North of the village, is a high rock, remarkable for its projecting from a sandy beach. At a distance it appears to be detached from the land. Between this and the high rocky point to the South of the village is a small bank of soundings, stretching some distance into the sea. The South side of this bank has irregular rocky soundings, from 25 to 8 fathoms; to the North of it the edge is very abrupt.

The district of *Ewa* occupies the S.W. portion of the island, extending eastward to within 7 miles of Honolulu, and 20 miles along the sea-shore. Unlike others on this side of the island, it is well watered by copious and excellent springs, the streams from which are sufficient for working sugar-mills. This is the best part of Oahu for raising cattle and sheep, which are seen here in greater numbers than elsewhere.

The *Pearl Lochs*, or *Pearl River Harbour*, lies on the South side of the island, the entrance being about 8 miles E.N.E. of Laeoa Point. It is an extensive inlet of the sea, into which the River Ewa and several other streams empty themselves. It derives its name from the fact of the pearl-oyster being found in it; it is not met with elsewhere in the Sandwich Islands. The inlet has somewhat the appearance of a lagoon which has been partially filled up by alluvial deposits, and affords abundance of excellent fish. The depth of water in the mouth is only 11 ft.; but after passing this coral bar, which is 400 ft. wide, the depth of water becomes ample for large ships, and the basin is sufficiently extensive to accommodate any number. If the bar were partially removed, which might be effected, it would afford the best and most capacious harbour in the Pacific. At present there is little necessity for this, as the neighbouring port of Honolulu is ample for all the present requirements.

HONOLULU is the capital and principal port of the kingdom of Hawaii, and indeed of this part of the Pacific Ocean. It is not very many years since it was first frequented by Europeans, but Vancouver passed it without much notice, in March, 1793, such is its apparent insignificance from the entrance. He was afterwards informed by Mr. Brown, of the ship *Butterworth*, of its excellence, and his tender, the *Jackall*, first entered it in 1794. Mr. Brown gave it the name of *Fair Haven*. Vancouver calls it *Honoonoono*.

Since the periods above named it has made a wonderful change in circumstances, and few places in the world now have such a variety of population and manners as is to be seen here.

As the whaling fleet became more numerous, wealth was gradually brought here, as it was the principal resort of the ships that came to refit. The population gradually increased, and instead of a town of grass huts, with only one house that had a chimney in it in 1827, when Capt. Beechey came here, it is now a large town of about 15,000 inhabitants. The situation being good, it

was eventually established as the capital of the Hawaiian kingdom, the residence of the consuls of foreign courts, and the chief port in the best channel of intercourse between the eastern coasts of the old, and the western coasts of the new world. It has a fine capacious harbour, formed by the coral reef, capable of accommodating 200 vessels at a time, and is perfectly safe in all weathers. A small steam-vessel runs periodically between Honolulu and Hawaii, and there are several schooners constantly trading to and from the various islands. The mail-steamers between San Francisco and New Zealand call here twice a month, and another line of steamers runs between San Francisco and Honolulu, twice a month.

The central part of the city now consists of regularly laid out streets, on either side of which stand houses and warehouses, constructed after the European style, generally painted, and frequently placed within spacious enclosures with gardens, while its outer portions are still chiefly composed of grass huts inhabited by the natives. Besides these, there are the king's palace, a fort, numerous churches and chapels, public offices, a custom-house and a sailors' home; also ample wharves, foundries, work-shops, and ship-yards to meet any emergency that may arise, even to making a steam-ship if ordered, but the charges are somewhat expensive, labour being very dear. In 1882, a marine railway was completed, capable of taking up a vessel of 1,700 tons, when light. On the West side of the harbour is a Quarantine Hospital, built on reclaimed ground.

Supplies of every kind, including fresh and salt meat, may be obtained here, and the prices are moderate. Excellent water is carried down from the Nuuanu Valley, in iron pipes, to supply the city and the shipping. Australian coal costs about 10 dollars per ton.

In 1881, 258 merchant vessels, with a total tonnage of 159,341, entered the port, of which 181, with a tonnage of 102,308, belonged to the United States. In the same year 19 whaling vessels, with a total tonnage of 6,083, called here.

The aspect of the country around Honolulu, as seen from the roads, is barren, the plain on which the town stands being destitute of verdure. This plain extends both East and West from the town, while behind it the land rises gradually towards the Nuuanu valley. Several crater-shaped hills are in sight, one of which, *Puowina*, called by the foreign residents the *Punch Bowl*, stands out in bold relief on one side of the valley.

The valley of Nuuanu is formed by a break in the central volcanic ridges of Oahu; it ascends gradually from behind the town, and is about 7 miles long, by half a mile wide at its entrance. It contracts until it reaches the northern side of the ridge, when it suddenly terminates in a deep precipice of 1,100 ft., called the *Pali*. Here the trade wind rushes violently through between two high peaks above 1,500 ft. in height, while their tops condense the clouds, whose waters are descending constantly in small silver rills, that leap from rock to rock on all sides, unite in the middle of the valley, and form a large

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brook, which is again distributed by the natives to give fertility and luxuriance to the vale below.

One of the most conspicuous points on the South side of Oahu is *Leahi* or *Diamond Hill*. It lies about $3\frac{1}{2}$ miles S.E. by E. of Honolulu, and forms a very picturesque object from the harbour. It is an extinct volcanic crater, the largest coast crater on the island, and has its latter name from the circumstance of bright crystals resembling the diamond being found on its sides. Its highest point reaches an altitude of 761 ft.

The mouth of the harbour is formed by an inlet through a coral reef, possibly kept open by the fresh-water stream flowing through the town; this has been supposed to be filling up the harbour and its entrance with alluvial deposit, as a considerable diminution in the depth is observed since the earlier explorations. This is more probably owing to an entire upheaving of the coast, as is evidenced elsewhere in the diminution of water on rocky shelves off the coast and the marks on the coast itself. It is true that this might be remedied without great trouble, by deepening the channel or by doing the same to the more extensive harbour of the Pearl Lagoons to the westward.

Lights.—A *fixed bright* light is exhibited from a lighthouse erected on the inner edge of the western reef, at half a mile within the entrance of the channel into Honolulu Harbour. It is elevated 26 ft. above the sea, and is visible 9 miles seaward between S.E. by E. and West. From the lighthouse the Spar or Fairway buoy bears S. by W., $6\frac{1}{2}$ cables; Diamond Point, S.E. by E.; Barber Point, W. $\frac{1}{2}$ S.; and the eastern corner of the Custom-house, N. by E. $\frac{1}{2}$ E., $2\frac{1}{2}$ cables. Near to this corner of the Custom-house, from a tower, a *fixed green* light is exhibited, elevated 28 ft. above the sea, and visible 2 or 3 miles. The green light is in lat. $21^{\circ} 18' 6''$ N., long. $157^{\circ} 52' 10''$ W.

Directions.—Vessels approaching at night should bring the leading lights in line, bearing N. by E. $\frac{1}{2}$ E., and should also be most attentive to the soundings, obtaining bottom under 40 fathoms, and not coming into less than 12 fathoms before anchoring.

To enter the harbour, bring the lighthouses or the two lights in a line, and keep them so until within 2 to 3 cables of the lighthouse on the reef, then steer to the eastward, to avoid the end of the spit on which the lighthouse is built, towards the East end of the new wharf, and when half-way between the light on the reef and the new wharf, steer N.W. to the anchorage inside.

A conspicuous *bell buoy*, painted black and white, with staff and cage, is moored in 16 fathoms, 4 cables S.E. by S. $\frac{1}{2}$ S. from the spar buoy lying on the East side of the entrance of the harbour, and a quarter of a mile from the shore reef.

The following directions for the outer anchorage are by Mr. H. Thompson, master of H.M.S. *Tulbot*, in January, 1845:—"Just without the reef, and at
North Pacific.

THE SANDWICH ISLANDS.

a short distance to the eastward of the entrance to the harbour, there is a space of ground which affords a fair anchorage in from 12 to 30 fathoms water, during the period that the N.E. winds blow steadily, viz., March to October, the remaining months being more subject to irregular winds. Those most feared are from the southward, which frequently, during the irregular season, blow very strong, and at the same time send in a heavy swell; therefore, vessels lying there should put to sea immediately on the appearance of wind from that quarter.

"The holding-ground is indifferent, consisting of hard sand and coral, and the surface very uneven. The marks for the best anchorage are as follows, viz.:—the flagstaff of Fort Honolulu, N. by E.; the summit of a round-topped hill just visible over the inner part of the neck of land which connects Diamond Hill with the other part of the island, bearing about E. by N. This hill is the only one visible in that direction."

The *Harbour of Honolulu* has a bar, with only 21 ft. water upon it at low water, and the channel is so narrow and intricate that no stranger should attempt it. Vessels bound in should signal for a pilot, who will come off if the weather is not too boisterous. Capt. Beechey considered the best anchorage outside to be in about 16 fathoms, with the Punch Bowl bearing N.E. by N. $\frac{1}{2}$ N., and the highest part of Diamond Point, E. by S. $\frac{1}{4}$ S. The bell buoy is moored near here.

Should it be necessary to enter the harbour, the morning is the best time, as there are then leading winds through the passage; but after the trade wind has set in it cannot be entered by a sailing vessel, except with the aid of a steam-tug. It is necessary to adopt the precaution of having boats ready to tow or run out lines to the reefs. Vessels entering or leaving without a pilot are charged half pilotage rates.

The wharf has been much improved and extended, so that vessels of any tonnage may lay alongside and coal there. In 1880, the depth over the bar at low water was stated to be 21 ft., and at full tide 23 to 24 ft., and that, excepting in the event of southerly storms, which seldom occur, there can be no difficulty in heavy ships entering or leaving at any ordinary half-tides. But it has been officially stated that steamers should not draw more than 18 or 19 ft. water to be sure of entering at all times.

During the visit of H.M.S. *Challenger*, in 1875, Lieut. Tizard states that the harbour of Honolulu was said to be silting up slightly. Dredging operations had been carried out, and, according to a recent American survey, there was a depth of 22 ft. on the bar at low water. The channel leading into the harbour is marked by an outer black can buoy and five red can buoys on its eastern side, and by piles erected on the edge of the reef on its western side, the outer pile being abreast the third red buoy from the entrance.

Vessels in Honolulu Harbour not lashed alongside the wharves have to moor head and stern, for which purpose anchors are placed at convenient distances

on the reef, on the West side of the harbour; it is advisable to moor with the vessel's head about N.E., as heavy squalls blow over the land from that direction, and during the winter months it is often necessary to drop an anchor under foot, as the wind frequently shifts to the S.W. and blows strong, but with sufficient warning to prepare for it.

The passage through the reef into the harbour, though well buoyed and beacons, is dangerous, and should not be attempted, even if the wind be fair, without a thorough knowledge of the port. From the outer anchorage run along shore in nothing less than 11 fathoms, and the buoys will point out the channel over the bar. When over the bar, stand on between the buoys and pile beacons,—the depth in the channel being from $5\frac{1}{2}$ to 6 fathoms. There is always a heavy swell on the bar with southerly winds, making it dangerous. Any one unused to the port should always take a pilot. The harbour affords accommodation for as many as 200 vessels at a time.

Lieut. Fleet, H.M.S. *Gannet*, 1880, states that alongside the coaling wharf, vessels will have near the South end about 4 fathoms under the keel, $4\frac{1}{2}$ fathoms on the off side, and 3 fathoms close to the wharf; steam-vessels drawing 22 ft. secure alongside the wharf. Welsh coal can be purchased for 11½ dollars a ton.

Much of the coral banks is exposed at low water. In consequence of the sea that rolls over the reef, and breaks in 4 or 5 fathoms water, boats must follow the same channel as large ships, or in all probability they will be run on the reefs, or be upset.

There are several pilots always ready to conduct vessels into and out of the harbour; and there are also steam-tugs for towage.

Tides.—It is high water, on full and change, at 4^h 25^m, the rise and fall being 2½ ft. at springs; but the tides here are much affected by the winds, gales (whether from North or South) bringing high tides, and a rise of 3 ft. Sometimes the rise is remarkably low, and without any apparent cause; it has been as little as 6 inches.

The only place remaining to be noticed as an anchorage is *Waikiki*, which is 2½ miles south-eastward of Honolulu. Between these two places there is a vast collection of salt-pits, the produce of which is exported to all the countries bordering on the North Pacific. There is anchorage off the village.

Whycote Bay, according to Vancouver, is formed by the land falling a little back round the S.E. point of Oahu, and, although open above half the compass in the southern quarters, it was considered by him to be the best anchoring place in the island, but he did not know of Honolulu.

KAUAI is called *Atoui* in Cook's voyage, *Atowai* in Vancouver's, and *Atou* by a third. The name is composed of two words—a *Tauai*, literally *and* *Tauai*. The meaning of the word *tauai* is, to light upon, or to dry in the sun; and the name, according to the late king, was derived from the long droughts which

sometimes prevailed, or the large pieces of timber occasionally washed on its shores (Ellis). This island is interesting as being the first land of the group visited by Cook on their discovery. "On Sunday, January 18, 1778, at day-break, an island (Oahu) made its appearance, and soon after we saw more land bearing North, and entirely detached from the former." On the 19th he anchored in Waimea Bay, on the South side of Kauai, and was received by the astonished natives with profound humility and reverence, a circumstance which has since been accounted for as stated in our introductory observations.

The island is 28 miles long, N.E. by E. $\frac{1}{2}$ E. and S.W. by W. $\frac{1}{2}$ W., and about 23 miles in greatest breadth, the channel separating it from Oahu being named *Kaieie Waho*, 64 miles broad. Like the rest of the archipelago, it is of volcanic formation. Its N.E. and N.W. sides are broken and rugged, but to the South it is more even. The hills here rise with a gradual slope, and at some distance from the shore are covered with wood. This is one of the best cultivated of the islands, and even when first discovered the plantations of the natives were managed with industry and neatness. The highest point of the island is called *Waialeale* or *Wailioli*, and its height is estimated at 5,000 ft.; it is said that there is a crater on its summit, from which there is a view of Oahu, 90 miles distant, to E. by S.

The two extremities of the eastern end of the island lie N. 14° E. and S. 14° W. 9 miles from each other, and are formed by low land. The former is a round-ing point, projecting into the ocean from a very remarkable forked hill that is, in a great measure, detached from the rest of the connected mountains of the island. The latter extends from a range of low hills that stretch along the coast at a small distance from the beach. The country inland here is most enchanting and rich. About 3 miles to the south-westward of the southern extremity lies *Makanuena* or *Koloo Point*, the S.E. point of the island, formed by a bold, bluff, barren, high, rocky headland, falling perpendicularly into the sea, having a remarkable dome-shaped mountain a short distance N.W. of it, and a range of hills, with eight craters, extending to the northward. Between this and the low point is a small cove (*Puna Cove*) accessible to boats only. This portion appears to be well watered. A heavy sea rolls in on this part of the coast. There are some silk (mulberry) and sugar plantations belonging to Europeans, but the greater part of the island is given up to cattle and sheep.

Hawiliwili Harbour, or *Hulala*, 8 miles N.E. of Koloo Point, is an indentation in the coast, three-quarters of a mile in extent, East and West, and the same North and South, but it is nearly filled up with reefs and shoals. The entrance, in which the depth is 3 to 4 fathoms, passes close to the North entrance point, a dangerous breaking spit extending nearly across from the South point. The channel passes westward of this spit, and leads to the harbour, in which there is a depth of $2\frac{1}{2}$ to 4 fathoms. At the North end of the bay is a wharf for shipping sugar, rice, &c., but the approach to it is very shallow. The observation spot, 1 cable to the southward, is in lat. $21^{\circ} 57' 50''$ N.,

long. $159^{\circ} 27' 20''$ W. It is high water, on full and change, at $3^h 45^m$; the rise is $2\frac{1}{2}$ to 3 ft.

Huleia River runs into the S.W. angle of the bay, and here is the village of Niumalu, 2 miles northward of which is *Lihue*, the centre of one of the largest and oldest sugar districts, the water for irrigation being supplied by a canal 10 miles long. *Wailua River*, 5 miles northward of the harbour, has a depth of about 20 fathoms inside the bar, and is navigable for 5 miles.

Koloa Bay will be recognised by the town, which has many high buildings, and extends from the beach to a distance of 2 miles up the slope of the hill, also by a low point with a sandy patch on its western side, situated between the town and Koloa Point. From this low point a rocky ledge extends out a short distance, and somewhat protects the anchorage. A red buoy for the mail steamer is moored in 10 fathoms, and less water will not be obtained until near the buoy, when a berth will be found in about 11 fathoms, sand and shells, with the western church bearing N. $\frac{1}{2}$ E.; the low point, E. $\frac{1}{2}$ N.; and the dome-shaped mountain, N.E. There is a good landing-place in a small cove, protected by a reef extending about a cable from the shore; an artificial creek has been made at the head of this cove with sufficient space for one boat to enter.—*Lieut. Child, H.M.S. Peterel, 1875.*

About 2 miles inland from Koloa is the oldest sugar plantation in the archipelago.

About 7 miles westward of Koloa, and 6 miles to the south-eastward of Waimea, is the celebrated valley of Hanapepe, which has apparently been formed by volcanic action. At its entrance it is about half a mile wide, and decreases in width as it approaches the mountains. At its head is a waterfall.

The coast must now be approached with great caution, as opposite Kona Peak, on the West side of the entrance to Hanapepe Valley, a coral reef commences, and here stretches some distance seaward; thence it trends along the S.W. shores of the island as far as Point Mana or Kolo, the westernmost point of Kauai.

Waimea Bay, on the South side, is the best anchoring-place at the island, except in the months of January and February, when the trade winds are interrupted, and the wind blows strongly from the S.W., directly on shore. At about a mile West of Waimea is the spot where Cook's boat first landed on the discovery of the Sandwich Islands. Cook says:—The road, or anchoring-place, which we occupied, is on the S.W. side of the island, about 6 miles from the West end, before a village, which has the name of Wymoa. As far as we sounded we found that the bank has a fine gray sand at the bottom and is free from rocks, except a little to the eastward of the village, where there spits out a shoal, on which are some rocks and breakers, but they are not far from the shore. This road would be entirely sheltered from the trade wind, if the height of the land over which it blows did not alter its direction, and make it follow that of the coast; so that it blows at N.E. on one side of the island, and

E.S.E. or S.E. on the other, falling obliquely on the shore. Thus the road, though situated on the lee side of the island, is a little exposed to the trade wind; but, notwithstanding this defect, it is far from being a bad station, and much superior to those which necessity obliges ships daily to use in regions where the winds are more variable and more boisterous."

Capt. King adds that, in running down to the road from the S.E. point of the island, he saw the appearance of shoal water in several places at a considerable distance from the land; and when he was about 2 miles to the eastward of the anchoring-place, and 2 or 3 miles from the shore, he got into $4\frac{1}{2}$ fathoms water, although the soundings had been usually 7 or 8 fathoms. The whole distance between Koloa and Waimea consists of a series of sunburnt hills and barren plains, sloping gradually to the shore from the mountains, and now and then intersected by ravines or gulches. The town or village, which has about 1,200 inhabitants, takes its name from a river which, after a course of about 15 miles, falls into the sea at the place. Boats may ascend it for about three-quarters of a mile, and this is the only water that is not brackish. On the East side of the river entrance are the ruins of a stone fort, built by the Russians in 1815, but soon after abandoned.

Waimea Bay may be recognised by Kona Peak, which is of reddish appearance, and a conspicuous church in the village. With the church bearing N. $\frac{1}{2}$ E., a good berth will be found in 10 to 15 fathoms.—*Lieut. Child.*

The coast to the westward of Waimea consists of a sandy plain, from one-fourth to a mile wide, and 150 ft. above the sea, whence it rises gradually to the mountains. It has a sunburnt appearance, and is destitute of trees. On the low grounds the cocoa-nut tree thrives, and the sea-coast is considered the best ground for fishing, and the manufacture of salt might be extensively carried on.

Near Waimea are some curious sand-hills, about 60 ft. high, called the "Barking Sands;" when the sand is set in motion by sliding down them, a sound like subterranean thunder is emitted.

Point Mana, the West point of the island, is in lat. $22^{\circ} 14'$ N., long. $159^{\circ} 47\frac{1}{2}'$ W., and off it a reef of rocks extends about half a mile from shore. Near this the country assumes a very different aspect; from hence to Hanalei Bay the coast has a very rugged and romantic appearance, rising suddenly to lofty, abrupt cliffs, which jut out into a variety of steep, rugged, rocky points, apparently destitute both of soil and verdure, but terminating nearly in uniform summits, on which, as in the valleys, are patches of lively green, producing a singular effect.

Hanalee or Hanalei Bay lies on the North side of the island; Capt. Wilkes calls it *Halelea*, signifying the land or place of rainbows, a name arising from the frequent rains, which clothe the country in perpetual green. The village is at the head of the bay, which is of semi-circular form, a little over a mile in

width. Reefs and shallow water extend $2\frac{1}{2}$ to 4 cables from the shore, outside which the depth varies only from 6 to 7 fathoms.

It may be recognised by Na Pali Point, just West of the entrance. This point is the termination of some high land which slopes suddenly to the sea, some parts of the slope forming several needle peaks. On the extremity of the point there is a small hill, and a reef extends about three-quarters of a mile from the point. On the East side of the entrance is a dark, bluff head, with two sandy beaches a short distance to the eastward; a reef extends about 3 cables from it. A remarkable conical hill bearing S.S.E. will lead to the anchorage; a good berth will be found in 7 fathoms with the entrance to the river bearing E. by N., distant about 4 cables.—*Lieut. Child.*

Hanalee, besides bullocks (noble animals, and meat as fine as in England), and vegetables of the finest quality, furnishes fruits, poultry, turkeys, &c., cheap, and in abundance. Water can be filled in the boats, by sending them into the river.—(Belcher, vol. i., p. 61.) Here is the Princeville sugar plantation, which was originally planted with coffee, but the trees became blighted.

In August the anchorage is safe, but when the N.W. gales blow, a very heavy sea must tumble into the bay. Capt. Sir E. Belcher was informed that a Russian store-ship rode out the season in spite of everything. The anchorage is pretty well covered by a spit, over which there is about 9 ft.; but there is not sufficient space in bad weather for more than three vessels, although in the fine season the bay is spacious.

The landing is within the mouth of a small river, near the western point of the bay, which carries, for a considerable distance up, from one to three-quarters of a fathom, into fresh water, and is further navigable for boats or canoes (drawing 3 ft.) several miles.

The scenery is beautiful, and it is surprising that such a favourable spot should so long have been overlooked. The consul possesses a tract of land, on which his tenant feeds cattle, makes butter and cheese, and farms to great advantage. I am certain that our men derived more nourishment from the cattle we embarked there than from any previous diet, and, contrary to the general feeling, preferred it to salt, regretting its loss. I would, therefore, strongly advise ships of war to sacrifice much to secure these advantages.—*Sir Edward Belcher.*

Six large rivers flow into the sea on the North coast of Kauai, East and West of Hanalei Bay, irrigating a fruitful district, containing many large sugar plantations. At 6 miles westward of Hanalei Bay is the small harbour of *Haena*.

NIIHAU (*Oneow* or *Oneehow*) lies $17\frac{1}{2}$ miles W.S.W. of Kauai, the channel between being called *Kumukahi* or *Kaulaka Passage*. The island is about 15 miles long, N.N.E. and S.S.W., and 2 to 7 miles broad. The eastern side is rocky and unfit for cultivation, nor is there any shelter or anchorage on it.

It is comparatively low, and with the exception of fruit trees, which are carefully cultivated, it is destitute of wood. The soil is too dry to produce taro, but on that account it is well adapted to the growth of yams, &c., which are very excellent, and of an enormous size.

Niihau was famous for its yams, fruit, and mats, and was the property of the king, but was purchased by Mr. Sinclair, a New Zealand settler from the Canterbury district, who removed here with his family, and used the island exclusively as a sheep-walk. In 1877 there were about 75,000 sheep on the island, the inhabitants, 233 in number, being mostly in the employ of the owner.

The natives were a darker race than those on Oahu, and reminded Captain Beechey strongly of those on Bow Island. They lived almost entirely on the western shore, and were very poor.

Yam Bay.—On the western side of Niihau are some small bays or roadsteads, in which vessels may stop with proper precautions. Vancouver anchored off the South point of the island, in 14 fathoms, about three-quarters of a mile off shore, bottom soft, sandy, regular, and good, the S.E. point of the island bearing S. 77° E.; the West point, N. 48° W.; and Kaula Island, S. 58° W. He afterwards anchored in Yam Bay, in 18 fathoms, with the N.W. point bearing N. 25° W., $1\frac{1}{2}$ mile off; the West point, S. 15° E.; and Kaula, S. 43° W.; but this position, though the general rendezvous for ships, was a much worse position than the former one.

Cook anchored westward of the S.W. point during a strong easterly gale, one anchor in 20, the other in 26 fathoms, the South point bearing E.S.E., and the bluff head to the South of the North point of the road, N.E. by N.

Admiral Beechey says:—There is but one place in this bay, the same in which Vancouver anchored, on the western side, where the boat of a man-of-war can effect a landing with safety when the sea sets into the bay, which is of very common occurrence; this is on its northern shore, behind a small reef of rocks that lies a little way off the beach; and even here it is necessary to guard against sunken rocks; off the western point these breakers extend $1\frac{1}{2}$ mile. The soundings in the bay are regular, upon a sandy bottom, and with the wind from the eastward good anchorage, if required, will be found; but it would not be advisable to bring up under any other circumstance.

Lieut. Child states that *Cook's Anchorage* is exposed to the heavy north-westerly swell which frequently sets in and breaks some distance from the shore; the bottom is composed of large rocks, with patches of sand in some parts. Near the beach are a few huts and a church, also a derrick for loading and unloading boats. H.M.S. *Peterel* anchored in 9 fathoms, sand and rock, with Tahoorā Island bearing S.W.; the extreme of the reef off Kona Point, N. $\frac{1}{2}$ E.; and the church, N.E. by E. $\frac{1}{2}$ E. The landing-place is protected by some rocks in the N.E. part of the bay, and is situated just inside a lava patch, which from seaward appears like a point; with a heavy swell, landing

is impracticable. Whalers occasionally call here for fresh meat, but the sheep being bred for their wool only, very little meat can be obtained.

Directions.—Vessels bound to Cook's Anchorage from the north-eastward are recommended to pass about half a mile North of Oreehoua Islet, and keep about 2 miles off along the western shore of Niihau, as the trade wind blows more from the northward on this side of the island. *Kona Point*, about 5 miles North of the anchorage, is a long, low, sandy point, having a rock 18 ft. above water near it; the reef, which extends a short distance outside this rock, should not be approached nearer than three-quarters of a mile. When the landing-place bears E. by N., it may be steered for, the soundings decreasing gradually to 12 and 9 fathoms. As the rollers set in with but little warning, sailing vessels should proceed to sea on the first indication of them.

Lehua, *Oreehoua*, or *Egg Island*, off the North end of Niihau, is a rugged, naked, barren rock, to all appearance destitute of soil, and without any signs of habitableness. On its S.W. side is an extinct crater, near which is a spring of fresh water. It is of very small extent, and is separated from the larger island by a channel less than a mile in breadth, in which the depth appeared to be shallow and very irregular.

KAULA, or *Tahoora*, lies 19 miles S.W. by W. $\frac{1}{4}$ W. from Cape Kawaihoa, the South point of Niihau. It is a small, elevated island, about a mile in length, only inhabited by flocks of birds, for whose eggs it is visited occasionally.*

BIRD ISLAND, or *Nihoa*, also considered as a member of the Hawaiian Archipelago, lies about 102 miles W.N.W. of *Lehua*, and was discovered, April 13, 1789, by Capt. Douglas, of the *Iphigenia*, who gave the name to it. It had not been previously known to the inhabitants of the Sandwich Islands, who afterwards called it *Modu-manu*, which also means Bird Island. It is merely a barren rock, of volcanic origin; it is bold all round, and is the resort of numerous flocks of sea-birds. Capt. Harvey, R.N., made a plan of it, on a visit to it in H.M.S. *Havana*, December, 1856. The island was found to be about three-quarters of a mile long, by one-third of a mile broad, and 880 feet high, the North side being a perfect precipice; but on the South side there is a little bay where landing has been made in the summer season. The master

* *Papoua Rock*.—Cook heard of a small, low, uninhabited island, called *Tammatapappa*, *Modoo-papoupa*, *Komodocappa* (i.e., flat island), about five hours' sail to the S.W. from *Tahoora*. It was said to be visited for the purpose of catching turtle and sea-fowl. It has been stated by a whaler to lie in lat. $21^{\circ} 30' N.$, long. $161^{\circ} 18' W.$, but Capt. Gillett, of the missionary ship *Morning Star*, places it 60 miles S.S.W. of Kawaihoa Point, Niihau, or in about $20^{\circ} 48' N.$, $160^{\circ} 38' W.$, and says it can be seen 20 miles from aloft. Captain Stone, of the brig *Kamehameha*, says that he tacked within a mile of it. Notwithstanding these assertions, the U.S. ship *Portsmouth* could not find it, and the *Tuscarora* passed close to the position given by Capt. Gillett.

went as close as the boat could safely approach, and pulled along the island to observe the practicability of a footing being obtained in more moderate weather. He found within 3 cables there were soundings in 15 fathoms; could only see one spot—a large boulder beach of about 200 ft. in extent—where it appeared possible in the finest weather to land. The men-of-war birds came round the boat in some numbers, and were troublesome; no seals, sea-lions, or animals of any description were observed, nor any appearance of guano. From the formation of the rock, and the large amount of heavy rain that falls in its vicinity, it is not possible that any quantity could accumulate; nor were birds seen in such quantities as to warrant the expectation. The position of the N.W. peak is lat. $23^{\circ} 3' 15''$ N., long. $161^{\circ} 45'$ W.

The surveying-schooner *Fenimore Cooper* passed within a mile of this island. It was found to be about half a mile long, East and West, by a quarter of a mile in width, with a peak at each extremity, the eastern one of which was made out to be 534 ft. high. Capt. Patty, of the schooner *Maunakawai*, thinks landing practicable, although very difficult, at a small spur of sandy beach on the South side, where he also found a small drain of fresh water, and saw a few seals and plenty of birds. There is anchorage at from one-quarter of a mile to 2 miles off the South side, in from 7 to 17 fathoms.

This concludes the description of the islands composing the Hawaiian Archipelago. In the subsequent paragraphs we shall include all the islands to the northward of lat. 20° , some of which lie to the eastward of the Sandwich Islands.

DETACHED ISLANDS AND SHOALS TO THE NORTH OF LAT. 20° N.

The north-eastern part of the North Pacific Ocean is singularly free from isolated reefs or lonely islands, or even of announcements of islands or vigias. On the contrary, the south-western part abounds with lurking dangers, coral reefs and islands, and these have been multiplied to a very large extent by the vague notices derived from older authors, whose positions claim but little consideration, or from the still more vague accounts given by whalers, a class of ships whose estimate of position was generally of the loosest character. Usually keeping no proper dead reckoning, drifted in all directions by unheeded currents, very long out of sight of land in pursuit of their prey, they had often no means of giving a correct longitude or even latitude, and the great similarity which exists among most of the coral reefs and islands, renders their recognition when uninhabited very difficult. In consequence of this, the chart is apparently bestrewed with dangers, which it is certain do not exist in the

numbers specified, but of many of which we have no means of deciding as to their merits.

For further information, reference should be made to the "Lists of Reported Dangers to Navigation in the Pacific Ocean," compiled at the U.S. Bureau of Navigation, but reference will be made in the ensuing pages to those reports which are worthy of attention.

LOS ALIJOS, or Farallones Alijos, lying nearly 200 miles westward of the southern portion of the Californian peninsula, have been alluded to on page 185. It is a dangerous reef, composed of four principal rocks, which, in nearing them, show themselves successively. They extend about half a mile North and South, and not over a cable East and West, the southernmost and highest being 112 ft. high, and the northernmost 72 ft. Besides these there are numerous smaller rocks, the whole at a distance having so much the appearance of ships under sail, that such an error, easily made at night, would expose a vessel to the greatest dangers. The name of these rocks, first discovered in 1791, by Captain Marquina, in coming from the Philippines, and not again reported until Admiral Du Petit Thouars' examination, is expressive of their dangerous character—"rocks which land a ship's cargo." The latest observations place the southern rock in lat. $24^{\circ} 58' N.$, long. $115^{\circ} 52' 36'' W.$

GUADALUPE ISLAND lies about 140 miles off the northern part of the peninsula of Lower California. It is about 15 miles long, North and South, by 3 to 5 miles broad, and is very lofty in the interior, a chain of hills extending through the whole length of the island. The highest of these hills, near the North point of the island, is estimated to be 4,523 ft. in elevation, and one near the centre, 3,681 ft. The island can be seen at a distance of about 60 miles, and will appear, when bearing either East or West, lower at its southern extremity than at its northern.

Off the South end of the island, within a distance of $1\frac{1}{2}$ mile, are two rocky islets, the outermost of which is 560 ft. high. The shores are in general bold, rocky bluffs, with detached rocks close-to, but they have not been closely examined. No dangers extend beyond one-fourth of a mile from the island. The only anchorage is on the S.E. side, in a small cove, formed by a few rocky islets, which lie off in that direction. Here vessels may anchor in 7 fathoms water, sheltered from all winds, excepting from S.E. to E.N.E., which seldom blow here.

From unerring indications, there is no doubt that it has been once volcanic; it is very barren on its South end, but in the northern part there are several fertile valleys, and the mountains contain vegetation. Wood and water may be obtained from a small cove on the N.E. side of the island, and goats' flesh may be had for the trouble of shooting the animal.

This island was generally sighted by the Spaniards when bound to the south-

ward from Monterey, or from their other northern establishments; in which route they passed to the westward, out of sight of those islands which form the Channel of Santa Barbara, for the advantage of continuing in the strength of the N.W. winds; and thus they reached the island of Guadalupe, from whence they steered a course for Cape San Lucas. The North point of Guadalupe is in lat. 29° 10' 50" N., long. 118° 18' 30" W.*

Andrews Island, in lat. 24° 30' N., long. 131° 20' W., was seen by the barque *Dragon*. Her captain describes it as low, but visible 10 miles off. This is all that is known of it, but it seems circumstantial. However, this position was passed over by H.M.S. *Fantome* and the U.S. ship *Jamestown*, 1877, and Capt. S. G. Jones, ship *Victoria Nyanza*, sailed over it in September, 1878, and saw no signs of an island.†

* *Shelvoeks Island* ? lat. 22° 6' N., long. 112° 14' W.—Sir Edward Belcher says:—"On December 11, 1837, passed close to Guadalupe, and then explored a degree on the parallel where an island had lately been reported, to fall into the parallel of *Shelvoeks*, *Shelvoeks*, *Shalers*, or *Shovel Island*; steering easterly to Cape San Lucas, until I had sufficiently determined its non-existence within 50 miles East or West of its assigned position. The *Venus* also went over the same ground on nearly the same errand, and with like success." The U.S. ships *Mohican* and *Narragansett* searched for it unsuccessfully.

Legarde Rock, said to have been seen by the French commander of that name, in the *Jean Pierre*, September, 1868, in lat. 31° 12' 15" N., long. 125° 0' W., showing as three points of peaks, 25 or 30 ft. high, is most improbable in this great highway.

† *Henderson Island*, marked at 160 miles East of this, is probably intended for the island in South latitude. In addition to this the following may be noticed here East of Hawaii:—

New Island, lat. 28° 25' N., long. 133° 0' W., from whaler report.

Gaspar Rock, lat. 26° 30' N., long. 131° 0' W., a whaler report, is another disproved danger near this.

Cooper's Island or *Breakers*, in lat. 25° 48' N., long. 131° 26' W., or in 25° 30' N., long. 133° 0' W. This position was sought over, without success, by the United States' Exploring Expedition, and by the U.S. ship *Portsmouth* in 1873.

Copper (whaler report, or *Copper Island* (China Mail), in lat. 20° 6' N., long. 131° 54' W., and also in East longitude, and *Copper Island*, lat. 20° 26' N., long. 130° 54' W., and also in similar East longitude, may be repetitions of the same report. It was not found by the *Narragansett* in the latter position.

Maria Lazara, lat. 27° 47' N., long. 139° 25' W., was not found by the *Portsmouth*; but this, besides several other positions near it, has been placed in longitude 144° 30' W., and 156° W. A shoal has also been reported in 27° 40' N., 140° 49' W.

Barneys Rock, a whaler report, lat. 22° 0' N., long. 142° 0' W.; also an island, in 21° 0' N., long. 149° 30' W. The *Portsmouth* searched unsuccessfully for the latter.

Philadelphia Island, a whaler report, lat. 29° 4' N., long. 155° 46' W. It is marked as *Dona Maria Lazara* on some old charts: but one of the ships of the United States' Exploring Expedition passed over the site. *Arabia Shoal*, near it, in lat. 29° 30' N., long. 155° 55' W., was sailed over by the ship *Atlatl*. It had a large quantity of kelp fast to

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REED ROCKS.—It is stated that Mr. Reed, master of the brig *Emma*, on her route from Tahiti to San Francisco, discovered, October 8 (1850?), two rocks, lying N.E. and S.W., one 150 fathoms long and 66 wide, the other about 100 fathoms long and 38 wide; a depth of 5 fathoms was got on one part, and 3 fathoms alongside the rock. It was thought that the sea would break on it in heavy weather. Lat. 37° 24' N., long. 137° 27' W. They have been alluded to in a note on pp. 259—260.

The U.S. sloop-of-war *Falmouth* saw rocks in the same position in 1851. Capt. Redfield, of the whaler *Susan Abigail*, in 1856 discovered, according to observations which he calls excellent, 11 miles more to the northward, some rocks, with about 10 ft. of water over them, the largest 50 ft. broad and nearly 150 ft. long, and S.S.E. of them, one-fourth of a mile distant, a discoloration of water indicating another and smaller rock. Most probably these discoveries are one and the same danger, the position of which is the mean of those given to them by the discoverers. The barques *What-cheer* in 1858, and *Yankoe* in 1863, report to have run over the position without seeing anything. Captain Redfield's position is 37° 35' N., long. 137° 30' W.

Search has been made for these rocks by several of the U.S. surveying-vessels, but unsuccessfully. Still further examination is necessary to disprove the circumstantial accounts given above.

NECKER ISLE was discovered by La Pérouse, November 1, 1786. He described it as being very small, only a rock of 500 yards in length, and at most 360 ft. in height. There was not a single tree seen on it, but vegetation was abundant towards its summit. The bare rock was covered with birds' dung, and appeared white, contrasting with the different red spots on which the grass had not grown. Its shores are as steep-to as a wall, and the sea broke with fury against it everywhere; off its S.E. point only are a few rocks, extending about 2 cables. Its barrenness renders it unimportant to sailors, but its situation is not so, and was determined by Capt. Stanikowitch as 23° 34' N., long. 164° 47' 20" W.

It was surveyed by Lieut. Brooke, U.S.N., in the schooner *Fenimore Cooper*, and its centre is placed in lat. 23° 35' N. (nearly on the tropic), and long. 164° 40' W.

Lieut. Brooke's examination proves the island to be three-quarters of a mile long, W. by N. and E. by S., and 340 yards broad, with two peaks, one at

the bottom, and extended S.S.E. and N.N.W. 2 miles, by 1 mile in breadth. The lead gave 11 fathoms in several places. The *Portsmouth* searched for them without success. The *Tuscarora* sounded in 3,540 fathoms near the given position of Philadelphia Island.

Palmer Reef is also improbable. It was said to have been seen in the *Kingfisher*, in lat. 44° 23' N., long. 162° 53' W., but it is also on the track of the United States' Exploring Expedition, July 7th, 1841.

each longitudinal extremity, the western one about 280 ft. high, and the eastern one 250 ft.; a small island, about 100 yards to the North, is connected with the larger by a reef. He found from 15 to 18 fathoms water at 2 miles distance, in a north-easterly direction. Capt. Patty, of the *Maunakawai*, could not find any landing-place for boats, as the surf broke all around.

It was visited soon after by Capt. Brooks, in the *Gambia*. He says:—This island is rocky, and about $1\frac{1}{2}$ to 2 miles long, surrounded by a bank making off to the southward about 50 miles, according to Capt. Long's statement. Capt. Brooks crossed in lat. $23^{\circ} 14'$, and found it to be about 15 miles across from East to West. The western edge is very abrupt; the discolouration of the water may be seen at a distance of 3 miles from the mast-head. Soundings are from deep sea to 14 fathoms, which deepen to the eastward gradually to about 35 fathoms, at a distance of 15 miles. A vessel crossing this reef by heaving-to can take any quantity of fish of very fine quality. There is a ravine makes down from the S.E. end of the rock, where at some seasons there is water. A boat may land in good weather at the foot of this gulch.*

FRENCH FRIGATES SHOAL (*Basse des Frigates Françaises*) lies to the westward of the Sandwich Islands, and was also discovered and named by La Pérouse, November 6, 1786, during his passage from Monterey to Macao. He described it as a rocky bank, more than 12 miles in extent, and even with the water's edge, having on its N.W. extremity an islet, or bare rock, 100 yards in diameter, and 40 or 50 yards in height. The space between this rock and the breakers was occupied by three sand-banks, raised about 4 ft. above the surface of the water. The astronomer, M. Dagelet, made the islet in lat. $23^{\circ} 45' N.$, long. $165^{\circ} 50'$, and the eastern point of the reef in long. $165^{\circ} 40'$. Captain Stanikowitch gives it the same position.

It remained unnoticed for many years, except by some wrecks upon it, attributed, but in all probability without reason, to its wrong position on the chart. But when the guano excitement arose, it was examined by Lieut. Brooke, in the U.S. schooner *Fenimore Cooper*, in 1859, who reported large deposits of that substance. He made the islet in the centre to be in lat. $23^{\circ} 46' N.$, long.

* *Deckers Island*, a whaler report, in $23^{\circ} 24' N.$, $163^{\circ} 5' W.$, and also in the same East longitude, probably refer to this. About 5 miles South of the former position the U.S. ship *Tuscarora* sounded in 2,870 fathoms, and no sign of land could be seen from the mast-head.

Captain English, of the ketch *Lunalilo*, 1873, passed over a shoal southward of Necker Island, and sounded in 23 fathoms. Next day he passed over a shoal almost breaking, in lat. $24^{\circ} 33' N.$, long. $165^{\circ} 40' W.$

Frost Shoal, a bank with 17 and 20 fathoms water on it, was reported in 1859 by the ship *E. L. Frost*. It was of coral bottom, and said to be upwards of 50 miles in extent, North and South. Its position would be about $23^{\circ} 45' N.$, long. $163^{\circ} 30' W.$ Nothing more is known about it.—*Nautical Magazine*, 1859, p. 606.

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166° 16' 10" W., or 26' westward of Dagelet's position. By the same authority the East extremity is in lat. 23° 44' N., long. 166° 5' W.; the S.W. end of the crescent, 23° 41' N., 166° 13' W.

Lieut. Brooke spent four days in an examination of it, sailing all around and through the inner passages. The islet or rock (120 ft. high, 180 ft. base), with a small rock about 250 yards N.N.W. of it, he found in the centre of the reef. There were also five dry sand-spits, the largest three-quarters of a mile long, bearing from the centre islet N. 76° E. (true), 4 miles distant; the next, N. 45° E., 6 miles distant; then a very small one, N. 11° E., 5 miles; then one N. 8½° E., 4½ miles, also very small; and, lastly, one of half a mile diameter, N. 12° W., 5 miles distant from the centre rock. Besides these, heavy breakers were seen, N.W. ¼ N., 6 miles from the rock; then E. by S. ½ S., 9 miles; S.E. by E. ½ E., 5 miles; and S.W. ¼ S., 5½ miles from the rock. A passage was found nearly in a straight line from the southward of the N.W. breakers, close by the central rock (West of it), to the S.E. extremity of the reef, in from 12 to 17 fathoms, broken shells, rock, sand, and coral. Lieut. Brooke's position of the central rock is from the mean of a number of excellent observations. His bearings, as given above, are *true*; the variation he made (1859) to be 9° 15' E.

It was subsequently visited by Capt. N. C. Brooks, in the American barque *Gambia*, in May, 1859, and with the *Modern Times*, for the purpose of removing the guano, but none could be found. He says:—

Next visited French Frigates Shoal, situated in lat. 23° 46' N., long. 166° 14' W., or rather this is the position of the principal rock, on which a very large and extensive deposit of guano had been reported to exist. The reef is crescent-shaped, convex to the north-eastward, and about 45 miles in circumference. The position as given by Capt. Brooks, of the *Gambia*, differs from Lieut. Brooke, of the U.S. surveying-schooner *Fenimore Cooper*. Capt. Brooks is of opinion that his position is the correct one, as he took observations on both voyages to the place. He also landed on sixteen small islands or sand-spits which surrounded the rock. One point of the crescent is to the N.W., and the other bears S.S.E. The shoal is protected on the N.E. and S.E. by a reef on which the surf breaks heavily. The guano rock is about 180 feet long, and 40 ft. wide at the base, and rises very abruptly to the height of 125 ft., forming a ridge, at each end of which there is a space of about 12 square feet. This rock is situated in about the centre of the shoal, and can be seen at a distance of some 8 miles, and closely resembles a full-rigged brig. These shoals open to the West. There is no danger outside of the line of breakers. There is good anchorage inside, in from 5 to 14 fathoms water. The largest sand-spit of the group bears about N.E. by E. from the rock, about 4 miles distant. Inside of this spit there is a good harbour, where a vessel of any draught of water may enter and lie in safety from the sea with good anchorage. Water may be obtained on the largest of these spits at about 8 ft.

below the surface. It is very brackish, and strongly impregnated with lime. The shoals abound with fish and turtle.—*Nautical Magazine*, September, 1860.

Among the more remarkable wrecks was the *Daniel Wood*, a whaler, on April 14th, 1859. The crew lived on the islets for some time, but were rescued. The *South Seaman* was totally wrecked on them, March 13, 1859, but the crew of that vessel were also saved. The *Rebecca* was lost by mistaking the rock for a ship.

Brooks Shoal.—Capt. N. C. Brooks, after leaving French Frigates Shoal, and running 30 miles W. by N. (true) from it, crossed a shoal on which he found 14 fathoms water, and saw the bottom distinctly. Although this was the least water found, there may be less, and besides these coral reefs grow up very rapidly at times, and therefore caution should be used when near its position, about lat. 23° 52' N., long. 166° 46' W.

GARDNER ISLAND was discovered by Capt. Allen, of the whaler *Maro*, June 2, 1820. There is no doubt but that it is the same as the *Man-of-War Rock*, and the *Pollard Rock* and *Pollard Island* of the Americans. According to its discoverer, it is a small island, about a mile in circumference, and 900 ft. high, having at its S.W. point two large rocks running off to the N.W. Capt. Stanikowitch places it in lat. 25° 3' N., long. 168° 1' 30' W. Lieut. Brooke, U.S.N., makes its centre in lat. 25° 0' 40"; and 2½ farther East. By his description it is an inaccessible rock, 170 ft. high, with a base of about 60 ft., and a smaller rock close to its S.W. extremity, from which a reef makes out half a mile. A bank, with from 17 to 20 fathoms water, surrounds the rock, extending westward about 5 miles, and S.W. more than 8 miles.

Two Brothers Reef was so named by Krusenstern, from the vessel which was supposed to be wrecked on it, but it is thought that it was the French Frigates Shoal. The position given was lat. 24° 14' N., long. 168° 30' W.; but Capt. N. C. Brooks says that he passed over the position of an island given as 24° 6' N., 167° 55' W., without seeing anything, although there was every indication of land in the vicinity.

MARO REEF was discovered by Capt. Allen, in the American whale-ship *Maro*, in June, 1820, in lat. 25° 24' N., long. 170° 20' W. Capt. Stanikowitch, who explored it in 1828, found that it was 8 leagues in circumference, and that it was visible from the deck of his vessel at 6 miles off. His position of it is lat. 25° 46' N., long. 171° 49' E. Its N.W. end was placed by Lieut. Brooke, U.S.N., in lat. 25° 31' N., long. 170° 37½' W.

Capt. N. C. Brooks says:—We next ran for Maro Shoals, in lat. 25° 30' N., long. 170° 31' W. These shoals cover an area of about 35 miles in circumference, are low, and covered with breakers. They may be seen on a clear day

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MARO REEF—DOWSET REEF—LAYSAN ISLAND. 1113

from aloft at 5 miles distance; the discoloration of water may be noticed as soon as the breakers are seen. The shoals are enclosed by a line of detached breakers, and have a sandy bottom, with 1 fathom of water,—no rock or land above the surface, nor any lagoon inside. I consider these shoals very dangerous, as at times the breakers are low and scarcely to be distinguished from sea-caps. It is nearly encircled by a bank with 10 to 30 fathoms water as you recede from it. It is open to the westward, where there is good anchorage.

Dowset Reef, on which the whaling brig *Kamehameha* struck in 1872, is about 8 miles long, N.W. and S.E., and 4 miles broad; in some parts the reef is awash, and the sea breaks all over it. The position of the centre, as determined by the master of the *Kamehameha*, is lat. 25° 13' N., long. 170° 38' W., and about 13 miles South of Maro Reef.

LAYSAN or Moller Island is an American discovery. Capt. Stanikowitch, not knowing that it had been previously seen, gave it the name of his vessel. He describes it as a small, low island, uninhabited, of a circular form, with a lagoon, and 6 miles in circumference. From his observations it lies in lat. 25° 46' N., long. 171° 49' W. Its height is about 25 ft.

Lieutenant Brooke, U.S.N., makes its centre in lat. 25° 47' 17" N., long. 171° 52' 47" W., and states it to be 2 miles long, and 1½ mile broad, a low island, covered with shrubs, agreeing with the description given by Captain Longbank, of the barque *Clara*.

Capt. Brooks says:—Laysan Island is in lat. 25° 46' N., long. 171° 49' W., is 3 miles long and 2½ miles broad, and covered with a luxuriant growth of shrubs. It is surrounded by a reef about half a mile from the land. Outside of this reef there is a bank 5 miles wide, on which I found from 14 to 19 fathoms water. There is a boat passage inside the reef nearly the whole way round the island, the only obstruction being on the South and S.E. sides. Good landing can be found anywhere, excepting on the South and S.E. sides; good anchorage anywhere on the West side; the best, however, is about half a mile from the S.W. point, in from 8 to 12 fathoms water. It can be approached from any point of the compass, no dangers existing within half a mile of the reef. On the East end of the island I found the remains of a wreck, but saw no signs of a camp.

There is a lagoon on the island, about 1 mile long and half a mile wide, with 5 fathoms water in the centre, and coral bottom. On the shores of this lagoon I found salt of good quality.

There are (1859) five palm-trees on the island, 15 ft. high, and I collected twenty-five varieties of plants, some of them splendid flowering shrubs, very fragrant, resembling plants I have seen in gardens in Honolulu. I saw on the beach trunks of immense trees, probably drifted from the N.W. coast of America.

North Pacific.

The island contains about 50 acres of good soil. It is covered with a variety of land and sea birds; some of the land varieties are small, and of beautiful plumage. Birds' eggs were abundant.

There is a very small deposit of guano on this island, but not of sufficient quantity to warrant any attempts to get it. Dug a well, and found very good water. The reefs here abound in fish and turtle.*

LISIANSKY ISLAND was discovered by Capt. Lisiansky in the Russian ship *Neva*, which struck on its reef on October 15, 1805, and was nearly wrecked. According to its discoverer's description, it is a small, low island, almost on a level with the sea, exclusive of a small eminence on the eastern part. Its soil consists of coral sand, overgrown with grass and creeping plants, and full of holes. There is no water to be found, and consequently there are no trees or shrubs. Lisiansky found several large trunks of trees thrown on to the beach. He calls the shallow S.E. part of the extensive reef, in the middle of which the island stands, the *Neva Shoal*, from his vessel. This is about 1½ mile E.S.E. from the island in his plan.

Capt. Patty states that the island is 1½ mile long, and the northern part 1 mile wide, elevated from 20 to 40 ft. above the sea. It is surrounded by detached rocks, which from E.S.E. to S.W. make off as far as the eye can reach.

Capt. N. C. Brooks visited it in the *Gambia*, in 1859. He says:—Lisiansky, Lassion, and Pell, are one and the same island. On most charts quite a group is laid down, but there is only one island, situated in lat. 26° N., long. 173° 57' W. It is 3 miles long, and 2 miles wide, and is surrounded by a reef, on which the sea breaks heavily. A bank makes off several miles, on which there is 19 fathoms water, shoaling to 8 fathoms near the reef. This reef is about half a mile from the island on the East and North sides; on the West side it extends in a circular form at a distance of 2½ miles, the inside forming a lagoon. This island should not be approached from the South, as a line of detached breakers makes off for many miles, and can scarcely be distinguished from sea-caps. Upon this line the *Holder Borden* and *Conahassett* were lost. This island should be approached from the North and by standing round to the westward, the island bearing due East. Good anchorage may be found anywhere outside the lagoon, in from 10 to 14 fathoms. In entering the lagoon on a line with the reef, there are two very large breakers about three-quarters of a mile apart, being North and South of each other. Between these, on the same line, are lesser breakers, through which a vessel may enter in a channel about a quarter of a mile wide, with 4 fathoms water. Just inside the reef I found 12 fathoms,

* *Bunker Island*, according to Capt. Kotzebue, was discovered by an American, January 11, 1815, in lat. 28° 20' N., long. 172° 30' W. And there is an island named *Phisadelpia* in the American list, in lat. 28° 0' N., long. 173° 30' W. Captain Patty, of the schooner *Manuakaua*, sought for it without success.

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gradually shoaling towards the land. A vessel may anchor within half a mile of the land, in 4 fathoms water, with good anchorage. There are rocks under water in this lagoon, which may easily be avoided by keeping a good look-out at the mast-head. I found about a 2-knot current setting North and South; the tide rises and falls 24 inches. Good water may be obtained here with very little trouble. The shoals abound with fish and turtle. Landing can be effected anywhere on the island. On the South end, near the centre, there has been a lagoon, but it is now partially overgrown with shrubs.

On the East point, about half-way, is a hill about 40 ft. high, with a look-out pole and cask. On the South end I found a ship's house which had been used to sleep in. On the North end I saw the trunk of a redwood tree, 12 ft. in circumference. On the West side found a notice left by the *San Diego*, taking possession for parties in San Francisco, dated April 27th, 1859. I consider the lead the safest guide at night among these islands as they are all surrounded by a bank for some distance off shore. Passed over the position of Neva Island, but saw no land.

There is a dangerous shoal discovered by Capt. Stenikowitch in 1827. The eastern extreme of this lies S.E. ½ S. 7½ miles, from the N.W. part of the island, and its western extremity at the distance of 4 miles.

The islands called *Laskar*, *Lasan Rys*, *Lassiano*, *Nearas*, and *Nera*,* are doubtless intended for the above, as the positions of most of them have been passed over. It has been also called *Sapron Island*, and *Pell Island* by Capt. Pell, of the whaling brig *Delaware*.

Captain Lisiansky places the centre of the island in lat. 26° 2' 48" N., long. 173° 42' 30" W.; Captain Brooks, as before stated, in lat. 26° 0' N., long. 173° 57' W.†

* *Neva Island*, in 25° 50' N., 172° 20' W., was not seen by Capt. Patty, schooner *Manuakawai*, nor by Capt. Brooks in the *Gambia*, as above stated.

† Some very doubtful islands have been announced in this neighbourhood, of which the following may be mentioned:—

An island, lat. 28° 35' N., long. 171° 42' W. (China Mail.)

Massachusetts Island, lat. 28° 30', long. 176° 50' W., whaler report. Captain Patty, of the schooner *Manuakawai*, ran over the place without seeing it, or *Philadelphia Island*, lat. 28° 20' N., long. 172° 30' W.

New Island, 26° 24' N., 170° 54' E., and *Bassious Island*, 26° 6' N., 173° 27' E., are both from whaler report, and are very doubtful. *Laysans Rys* and *Laskar Reef*, sometimes placed hereabouts, are evidently Lisiansky Island, badly spelt, and placed in East instead of West longitude.

Drakes Island, a whaler report, lat. 25° 30' N., long. 174° 0' W., is probably Lisiansky Island.

An island in 21° 0' N., long. 176° 30' W., from whaler report.

Palmer Reef, according to Captain Palmer, of the *Kingfisher*, in lat. 20° 54' N., long. 173° 35' W., has 4 feet water over it.

A Bank, reported by Capt. Peil, of the brig *Delaware* (see note below), in lat. 25° 50', long. 174° 26', or, according to whaler report, 1° more to the eastward, apparently lies to the S.E. of Lisiansky Island. Lieut. Brooke, U.S.N., of the *Fenimore Cooper*, found bottom at 15, 17, 18, 20, 25, and 40 fathoms, between the parallels of 25° 43' N. and 26° 3' N., and the meridians of 173° 29' W. and 173° 32' W. It appears to be a south-easterly extension of the bank around Lisiansky, which island the *Cooper* could not gain on account of stormy weather. Nothing further is known of it.

PEARL and HERMES REEF is an extensive shoal, on which two British whale-ships, the *Pearl* and the *Hermes*, were wrecked on the same night, and within 10 miles of each other, April 26, 1822. They were cast away on the East side of the island, and were fortunate in having favourable weather for several days, which enabled them to save a great portion of their stores, and to build a vessel of about 30 tons from the wrecks, with which they reached the Sandwich Islands in safety.

It was visited by Morrell in 1825, by Stanikowitch in 1827, and a plan of it is given by Capt. Duperrey. There are considerable differences in the respective positions assigned by each.*

Capt. Stanikowitch says it consists of several small islands, of which the two largest are named Pearl and Hermes, encircled by a reef, through which is a passage by which the *Deliverance* passed to an anchorage near the larger of the two islands.

Capt. N. C. Brooks says:—The group consists of twelve islands, surrounded by a reef 50 miles in circumference, on which the sea breaks heavily. It is open from the West. There is a lagoon inside, where vessels may lie in 5 to 15 fathoms, but they cannot approach within 2 miles of the land. The only passage to the lagoon is from the N.W. The largest island, which bears E. by S. $\frac{1}{4}$ S. from the entrance, may be approached within 2 miles safely. There is good anchorage anywhere outside, in from 8 to 12 fathoms, but the best is on the N.W. side, near the passage to the lagoon. The current sets to the North and South at the rate of 2 knots. The tide rises 24 inches; the prevailing winds are from the E.S.E.

The largest islands are covered with coarse grass and trees. I saw the remains of the two wrecks, the keel, stem, and stern-post, with three iron tanks, still standing. I brought away a wooden mortar used by the party on shore. The remains of the camp still exist on the large island. I took possession of

* *Delaware Bank*.—The American brig *Delaware*, H. Hunt, lieutenant-commander, discovered a bank above the water in lat. 27° 26' N., long. 174° 25' W., in 1844, which, seen at some miles distance, appeared to be 12 or 14 miles long. It is stated, also, that there are several others in the neighbourhood, many of which are not known. It should be noticed that this Delaware Bank is above water, and 90 miles to the North of that noticed above.

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this group. A bank makes off to the East and North for about a mile, and to the West for several miles, with from 8 to 16 fathoms, and no dangers outside the breakers. Plenty of fish and turtle.

It was partially examined and the positions established by Capt. Reynolds, in the U.S. ship *Lackawanna*, in 1867. He says:—Pearl and Hermes Reef, like Ocean and Brooks Islands, has a coral wall above water at its N.W. extreme, which, however, shows more in the shape of detached rocks than as a continuous parapet, and, soon expending itself beneath the surface, does not reappear, at least so far as our examination showed; this was not very close, as I had time only to get the outline of the reef.

The N.E. corner includes a sand island. Another showed itself some miles to the westward in the lagoon. Three others lie along the southern edge of the reef, which turning to the northward and westward, close to the westernmost island, soon after ceased to show any signs of breakers. Shoal water, however, makes out for some miles to the West, and then trends in north-easterly towards the N.W. rocks. In this the western side of the reef resembles French Frigates Shoals.

We made the circumference of the reef to be 42 miles. Its shape is irregular, its diameter from North to South $9\frac{1}{2}$ miles, from East to West 16 miles. The N.E. point of the reef is in lat. $27^{\circ} 56' 30''$ N., long. $175^{\circ} 46'$ W.; the S.W. end, lat. $27^{\circ} 48' 45''$, long. $176^{\circ} 0' 30''$; the S.E. point, lat. $27^{\circ} 48'$, long. $175^{\circ} 47' 30''$.

Gambia Shoal was discovered by Capt. Brooks, of the *Gambia*, 1859, who states it to be 40 miles W. by N. from Pearl and Hermes Reef. The bottom was distinctly seen, and had 14 fathoms over it. On the latest charts it is placed about 30 miles westward of Pearl and Hermes Reef.

BROOKS or MIDWAY ISLANDS.—This atoll is of much more interest than its uninhabited and barren condition would warrant. It was discovered by Capt. N. C. Brooks, in the *Gambia*, July 5th, 1859. He called the two islands *Middlebrook Islands*, and took possession of them for the United States, leaving a Kamchatkan as a settler. On his return he kept its position a secret, and his discovery was utilized by the Pacific Mail Company, who intended forming a depôt here for their Trans-Pacific steamers, in preference to Honolulu, which was thought to be under foreign influence, establishing here a coaling and refreshment station.

With this view it was closely examined in September, 1867, by Captain Reynolds, U.S.N., in the *Lackawanna*, and the following is his report, as published by the U.S. Bureau of Navigation.

The reef encircling Brooks Island is pear-shaped, with its stem part to the eastward. It is 18 miles in circumference, as measured by the patent log in the two circuits around it, and is without a break, except on its western side.

At the N.W. point is a little patch of breakers, a few detached rocks, and then commences a compact coral wall of about 5 ft. elevation, and, as far as our observation went, from 6 to 20 ft. in width, which continues for $4\frac{1}{2}$ miles to the southward and eastward, when it loses its uniformity of surface, and presents a line of detached rocks, very little more than awash, for $2\frac{1}{2}$ miles to the southward; there, off the centre of Middle Brooks Island, the rocks dip under water, but re-appear 2 miles to the westward, from whence they again show as a continuous wall for about $4\frac{1}{2}$ miles to the northward and westward, ending there, and forming the South side of the entrance to *Welles Harbour*. The entrance is about three-quarters of a mile wide, and from its northern edge to the N.W. rocks there is a bed of coral from 1 to 16 fathoms, showing above water in one place, with occasional breakers. (The chart shows the entrance to be only one-third of a mile wide.)

The northern, eastern, and southern portions of the reef are steep-to, to the rocks. We saw the bottom in two places only where the soundings are shown on the chart.

On the West side sheltered anchorage, during the trade winds, can be had in from 10 to 13 fathoms, but on a very foul bottom. The best outside anchorage is in *Secord Roads*, in 10 to 13 fathoms.

Middle Brooks Island.—At the eastern extremity of the reef, or in the stem of the pear, is *Middle Brooks Island*, also pear-shaped, $1\frac{1}{2}$ mile in length, and half a mile wide. It is of a nearly uniform elevation, varying from 6 to 15 ft., covered with a growth of small shrubs, coarse grass, and some vines. The soil is all coral, sand, and shells, except a small portion on the South side, where there are a few acres of mould 2 ft. in depth. No black earth is to be found on this island. The beach is of a dazzling whiteness. By digging 4 to 7 ft., water is reached, which becomes potable after standing. Its North point is in lat. $28^{\circ} 13' 30''$ N., long. $177^{\circ} 18' 20''$ W.

At $1\frac{1}{2}$ mile West of Middle Brooks Island is *Lower Brooks Island*, a small spit intervening; it is a sand-heap of irregular shape, $1\frac{1}{2}$ mile long, three-quarters of a mile broad, and 57 ft. high at the flagstaff, its greatest elevation. Vegetation is just commencing on this island, in the shape of detached clumps of shrubs around portions of its edge, and an occasional growth of grass, the greatest abundance being on its S.W. extremity. No black earth is to be found on it; on the contrary, the glare from the white sand distresses the eye.

Capt. Burdett informed me that he had seen 250 yards of it wash away, and begin to re-form, during the few weeks he had been ashore. The sand-spit up by the N.W. rocks, which was quite conspicuous when we anchored near it on the 16th, had almost disappeared by the 27th, when I landed on it; but, from the quantity of sand thereabouts, I presume a permanent sand island is forming.

On the lower island the agent of the Pacific Mail Company had established himself, because it borders on the harbour.

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roomy and as safe, but has not quite the same depth of water on its bar, having but from 21 to 16 ft. at low water. The anchorage is in lat. $28^{\circ} 14' N.$, long. $177^{\circ} 23' 15'' W.$

The bar is quite narrow, and has an uneven bottom of coral rock and small sand holes. Its depth varies from 21 to 16 ft., but changes so often and so constantly, from $3\frac{1}{2}$ to 3 fathoms, as to make it unsafe to count on crossing it without getting a 3-fathoms cast or two. We had 19 ft. going in, and two casts of 18 ft. in going out, both times at low water.

Like Honolulu, the entrance to it is from the West, through a narrow opening in the coral reef 800 ft. across where most contracted. It can be entered as readily as Honolulu at all seasons of the year. Depth of water for anchoring 5 to 7 fathoms, white sandy bottom.

This harbour is cut off from the lagoon by shoal water a mile in width; and our survey, carefully made, does not disclose a passage anywhere for ships into the lagoon. It would be possible for a light-draught vessel to get into the lagoon by passing to the northward of the "Middle Ground," and threading her way in among the rocks, but no channel proper for ships exists.

The lagoon is 2 miles in length, and $1\frac{1}{2}$ mile wide at its greatest breadth. There are many coral lumps in it, with from 1 or 2 fathoms water over them; otherwise the soundings are regular, over a white sandy bottom.

Welles Harbour must, therefore, be the resort for ships drawing less than 18 feet, or, at high water, of a little over that draught. Vessels of deep draught must lie in *Seward Roads*, picking out a sandy bottom to let go in.

The greatest rise and fall of the tide, observed during the neap tides, was 18 inches: the lowest 15 inches. Ebb runs $6\frac{1}{2}$ hours, flood $5\frac{1}{2}$ hours. From the appearance of the beach I suppose the rise of the spring tides is as much as 3 feet, which would allow a deeper draught to be carried over the bar at those periods. The bar is well within the entrance, and there is no swell on it during the trade winds.

The flood sets to the northward, the ebb to the southward, from 1 to 2 knots. At Welles Harbour the current *always* ran out to the westward, with very little strength.

The coral shelf which runs from the N.W. end of the reef to the southern wall gives very irregular soundings, having deep fissures between the rocks, and again spaces of sandy bottom. On this shelf, at our anchorage of the 23rd of August, we lost one anchor with 15 fathoms of chain, and broke the flukes off another; could not recover either of them.

Two circuits of the reef, made with good look-outs aloft, disclosed no dangers outlying it; and, so far as our observation goes, Pearl and Hermes Reef to the eastward, and Ocean Island to the West, are the only dangers in the way of direct approach.

Steamers, in approaching Brooks Island from the eastward, should make Middle Brooks Island, and follow the southern wall to the entrance of the har-

bour. If coming from the West, the Lower Island should be made. Sailing vessels from the eastward, during the trade season, should keep to northward of the reef, and pass around the N.W. rocks, to retain a fair wind for Seward Roads. Square-rigged vessels must warp into the harbour with easterly winds.

On the N.E. beach of Middle Brooks Island a broken lower mast of a ship was lying; it was 2½ ft. in diameter, and strengthened with iron bands. On the East beach and on the bluff occasional drift-timber is to be met with, and some lumber, mostly spruce and redwood. On the West side, or lagoon beach, was a portion of the trunk of a redwood tree 5 ft. in diameter, and also the skeleton of a calf sperm whale. On the lagoon side of the other island two lower masts of junks were stranded, and several redwood logs elsewhere, one of these over 2 feet in diameter.

Tropic birds, men-of-war hawks, and gulls, swarm upon these islands. A few curlew and plover are the only land birds met with. Turtle abound, but seals were seen only occasionally. Fish of many varieties in great abundance; we hauled the seine frequently, catching enough for all hands; among them many fine mullet.

As there is more than ordinary interest in this lonely spot, we add the account given by the naturalist, S. D. Kennedy, Esq., surgeon to the *Lackawanna* :—

These are two long, low islands, chiefly formed of coral shells and sand. They lie in a lagoon surrounded by a barrier reef, except at one point, where a breach in its continuity affords an entrance of 3 fathoms in depth.

The North island is 1 mile in length, and half a mile in width; while South Island is somewhat larger and higher, but has less soil and scantier vegetation. A beach, consisting of white sand, disintegrated shells, and coral, extends from the lagoon to a distance of from 50 to 100 yards all around the North island. Inside this space the island, gradually sloping from its two higher points (the north-eastern 15 ft., and north-western 8 ft.), is covered with a growth of coarse grass and low shrubs. From its north-eastern point a ledge of coral rock, lying at an angle of 5 degrees, extends about 100 yards into the lagoon. From this point a fringing reef of the same kind of rock, at about the same declination, runs for two-thirds of the extent of the eastern side of the island.

Judging from this peculiarity of coral formation, and the numbers of dead shells, corals, and mollusks found on the highest points, this portion of the island seems to be emerging. Over all that part of the island where vegetation is found, there is a superficial layer of fine, porous, grayish sand; but generally it is devoid of vegetable mould. Beneath, you come at once to coarse sand and gravel.

On the South side of the island there is a slight depression, embracing about 5 acres, extending from N.N.E. to S.S.W. This area has a superficial stratum of vegetable mould, from 18 inches to 2 feet in depth, mixed with a small percentage of guano; beneath this is a layer of coarse sand of the depth of 1 foot,

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and below this another stratum of loose stone, shells, and corals, closely packed together, extending down to the hard coral. This foundation of the island, as of the reef, consists of madrepore, meandrina, and porites coral. But little of the red coral can be found about the island, or in the lagoon. This embraces the whole extent of anything like true soil that I was able to find on the island. This mould is, I think, of sufficient richness to raise potatoes, peas, beans, and other vegetables adapted to light soils. There is a small amount of guano mixed with it; and with cultivation it would doubtless become richer by the addition of decomposed vegetable matter.

The vegetation of the island consists entirely of shrubs, herbs, and coarse grasses; none of the shrubs are over 3 to 5 ft. high. Of these, and the herbs, the principal families are the leguminosæ, lobeliacæ, portulacæ, and convulvaceæ. Some seem to be new species of the different genera of the above families.

On both islands several wells have been dug, and water found at depths of from 4 to 7 ft. I have tested the water taken from these as far as the materials which I have will admit. When first collected, the specimens were so full of sand and organic impurities in a state of suspension, that it was necessary to filter them. After filtration, tested by different re-agents, they were found to be hard, free from organic impurities in solution, to contain carbonic acid, carbonate of lime, and a per-centage of chlorides. The quantitative analysis of these constituents I have been unable to make for want of proper materials, but have preserved specimens for further experiments. It becomes better adapted to drinking after standing some time. Captain Burdett, of the Pacific Mail Steam-ship Company, is reported to have found fresh water; but, so far, he has chiefly used it for washing, and the specimen sent off to me gave the same results, when tested, as the others. The water seems to become purer in proportion to the depth; and there is every evidence that wells, properly sunk to a good depth, would afford a good supply of potable water.

Immense numbers of sea-birds are constantly hovering over and alighting upon these islands. The bushes and surface of the ground are thickly covered with their nests; while the young birds, unable to fly, are so numerous as to make it difficult to walk any distance without trampling upon them. The principal varieties are gulls, tern, gannet, men-of-war, and tropic birds. From such vast numbers there should be a large amount of guano deposited; but, except in the 5 acres I have spoken of, its accumulation is small, owing to the looseness or porousness of the soil allowing it to be washed away or filtered through it.

The lagoon is full of fish, seals, and turtle. The seal is the *phoca vitulina*, or common hair seal, and is not of much commercial importance. The fish belong principally to the mullet, perch, and mackerel families; many of them are of most brilliant colours, and seem to be species of the genus *coryphæna*

North Pacific.

(dolphins). Large quantities of the holothurian, *bêche de mer*, exist on the bottom of the sea, both inside and outside the reef, and can be gathered without any difficulty.

During the seventeen days that this vessel remained at the islands, the lowest point which the thermometer reached was 72°, while the highest was 89°. The barometer varied from 29.22 to 30.25.

There appears to be enough true soil, of sufficient depth to raise a good many vegetables upon it at present, and with but little trouble the extent of this area might be increased.

The water in some of the wells now dug might be used in an emergency, and doubtless by sinking properly-constructed wells to a sufficient depth, perfectly potable water may be found. Owing to the nature of the soil, these may be made with but little trouble, and at a very small expense.

OCEAN or Cure' Island is an American discovery, the existence of which was confirmed by Capt. Stanikowitch, of the Imperial Russian Navy, in 1827. It is a small, low, and very dangerous island, with two sand islets, surrounded by a reef, on which Capts. King and Molteno were wrecked in the *Gledstone*; the American whale-ship *Parker* was also lost here. The principal island is stated to be 1½ mile long, and three-quarters of a mile wide; and the others are two small islets or sand-banks. The opening into the lagoon is on the S.W. side, and is rather less than a mile wide. It was examined by Capt. W. Reynolds, U.S.N., in the ship *Lackawanna*, in 1867, and is thus described:—

Ocean Island is almost the facsimile of Brooks Island, as will appear from an inspection of the chart. It commences, also, with a coral wall at its N.W. extreme, which continues without a break until it dips under water about the centre of Green Island, but does not crop out again. From the end of the wall the line of breakers continues to their termination about a mile West of the N.W. end of Sand Island; from thence to the N.W. rocks the water is shoal, and affords no entrance into the lagoon, all of which is shallow water.

Green Island, in the S.E. corner of the lagoon, is identical in appearance from the sea with Middle Brooks Island, except that some portions of the shrubbery appeared to have grown a few feet higher. There is a small sand-spit between it and Sand Island, as is the case at Brooks Island; but the *Sand Island* here has not more than 10 ft. elevation above the level of the sea. The trunk (and roots) of a large tree was lying high and dry on the S.E. side of this Sand Island, and on the N.E. end of Green Island we saw a ship's lower mast, which looked as if it had recently got ashore.

This reef is 14½ miles in circumference; no outlying dangers were seen from the mast-head, and no other land.

Sand Island is in lat. 28° 24' 45" N., long. 178° 27' 45" W.; the N.W. point of Green Island is in lat. 28° 24' 50" N., long. 178° 26' 5" W.

Captain Brooks describes it as consisting of three small islands or rocks, in

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line East and West, surrounded by a reef, 30 miles in circumference. A bank makes off round the reef at a distance of a mile, with 25 to 30 fathoms water. The surf makes off to the East a quarter of a mile, and to the N.W. 12 miles. The reef opens to the S.W. for about 3 miles. The best anchorage is found by bringing the N.W. point of the breakers North, in from 7 to 12 fathoms, 1 mile from the reef. The current sets North and South about 2 knots. The tide rises 22 inches.

They can be approached from any point, and can be seen from the mast-head 8 miles, being about 20 ft. high, and covered with bushes. On the North end of the large island, which is $3\frac{1}{2}$ miles long by $1\frac{1}{2}$ mile wide, there has been a lagoon, but it is now overgrown. On this island I found the remains of wrecks. Good water may be obtained on this island. The second island in size is about 2 miles long and half a mile wide, with little vegetation, few fowls, and plenty of turtle. The third is a mere sand-spit.]

It is probably the same as those described as *Massachusetts Islands* of the Americans, and *Dry Island*, with an attached reef, of Capt. Joy.

Krusenstern Rock was discovered by Lisiansky, October 23, 1805. The bank around it appeared to stretch North and South about 2 miles, and the sea only broke on it in one place. Lat. $22^{\circ} 15' N.$, long. $175^{\circ} 37' W.$ It is probably the same as *Saunders Island*, reported to be in $22^{\circ} 10' N.$, $175^{\circ} 42' W.$, and *Pylstaart Island*, 16 miles to the northward of the rock, but most probably it does not exist.

Patrocinio, or Byers Island, was discovered in 1799 by Captain Don M. Zipiani, commanding the Spanish vessel *Senhora del Pilar*. He states its extent to be 3 miles from N.N.E. to S.S.W., in lat. $28^{\circ} 9' N.$, long. $175^{\circ} 48' E.$; but the U.S. surveying-vessel *Peacock* passed near this spot without seeing it. This renders it more probable that it is identical with Byers Island of Captain Morrell, of guano celebrity. This he places in lat. $28^{\circ} 32' N.$, long. $177^{\circ} 4' E.$, but this position cannot be depended on.

Patrocinio, or Byers Island, according to Morrell, July, 1825, is of volcanic origin, moderately elevated, and has some bushes and spots of vegetation. It is about 4 miles in circumference, and has good anchorage on the W.S.W. side, in 15 fathoms, sand and coral bottom. There are no dangers around this island except on the S.E. side, where a coral reef extends about 2 miles to the southward. Sea-birds, sea-elephants, and green turtles resort to it, and plenty of fine fish may be caught on its shores with hook and line. Fresh water may be had from the S.W. side of the island. But, as said above, the positions, and even the existence of the island, are very questionable.

Morrell Island is another so named by Krusenstern from its discoverer, by whom it is placed in lat. $29^{\circ} 57' N.$, long. $174^{\circ} 31' E.$ It is said to be a small,

low island, nearly level with the water, 4 miles in circumference, apparently of volcanic origin. It was covered with sea-fowl, and its shores were lined with sea-elephants; green turtles were in abundance (July, 1825). On the West side a coral reef runs off about 15 miles; while another on the S.E. extends about 30 miles in the direction of S.S.E. These reefs afford good anchorage on the S.W. side; but on the East side the water is bold close to the reef. Another doubtful island in the same latitude is placed in long. 175° 42' W., from whaler report.

Capt. Cobb, commanding one of the Pacific Mail steamers, states that he has passed several times over and near the position of this island, in lat. 29° 30' N., long. 174° 30' E.

Sixty-four Fathoms or Mellish Bank.—A bank has been several times announced hereabout by whalers. The first in lat. 36° 25' N., long. 179° 30' E., from a notice in the China Mail. It is placed a degree farther South, from a report in the Alta California, and an American chart places it a degree still more South. *Mellish Bank* is said to be in lat. 34° 25' N., long. 178° 47' E. These possibly refer to the same, if it exists. At all events, it will be desirable to know whether there are soundings here. Until the negative is determined, it may be retained, as not being dangerous. Capt. Cobb believes in the existence of this bank, in lat. 34° N., long. 178° 18' E., as he met with discoloured water in the vicinity.

Crespo, or *Rica de Plata*, is said to have been discovered by Capt. Crespo, in the Spanish galleon *El Rey Carlos*, October 15, 1801. He saw it 10 miles off, says it is not low, and that it is in lat. 32° 46' N., long. 170° 10' E. On old Spanish charts *Rica de Plata* is placed in lat. 33° 30' N., long. 167° E. It is also placed by whaler report in 33° 56' N., 169° 15' E. An island has also been reported by a whaler in lat. 33° 3', long. 170° 7'. Against this it may be stated that it was neither seen nor heard of by Du Petit Thouars, who passed near its position.

Admiral Krusenstern says, that as the Japanese believed in the existence of an island of silver, and one of gold, it is probable that the Spaniards applied these attractive names during their search for the precious metals in the South Seas. The navigator would make a loss of time in seeking the fabulous isles of *Rica de Oro* and *Rica de Plata*, the latter term sometimes being applied to this island.*

* To the south-westward of this the following doubtful islands may be noticed :—

Burrows Island, lat. 22° 0' N., long. 168° 27' E., rests upon a single announcement in the China Mail.

An island, in 23° 3' N., 162° 57' E., from whaler report.

Deik Island, 23° 45' N., 163° 14' E., probably is the same as *Necker Island* in West

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In all the space between this and the coasts of Japan and Formosa a great number of shoals and islands were marked on the charts. As the existence, or at least the positions, assigned to many or most of these appeared to be very doubtful, there was considerable difficulty in determining on the point. They would seem to have been inserted on the charts from the uncertain reckoning or observation kept on board whaling vessels, or others of that class, which, from the very nature of their pursuits, could not be entitled to much confidence.

Very many of these supposed discoveries are evidently of the most worthless nature, and it would seem almost a waste of space even to enumerate them. In the great work of Admiral Krusenstern these guesses and mistakes are most industriously collected, and their proper value assigned in most instances. In the later works published by the U.S. Bureau of Navigation, similar reports have been incorporated with the older notices, and we have followed them in many instances. It will be in the memory of most sailors how the chart of the North Atlantic was disfigured with "vigias" and supposed islands and shoals. The deep-sea sounding machine has disposed of nearly every one of these terrors to the navigator. It were much to be desired that the same process could be so thoroughly applied to the great highways of the North-western Pacific.

It is believed that in the ensuing lists only those deserving of any credence are preserved in the text. Those which are manifestly spurious are given as foot-notes.

Marcus Island has been shown as a doubtful island, in lat. 24° 25' N., long. 153° 45' E., but several other announcements of islands are found hereabout. *Islands*, from whaler report, in lat. 24° 0' N., long. 153° 40' E. Another island in 24° 5' N., 154° 10' E. It was seen by Capt. Kilton, in the *David Hoadley*,

longitude. *Darker Island*, 22° 21' N., 163° 5' E., is evidently meant for the same.

A reef or island, reported in 23° 45' N., 161° E., was searched for unsuccessfully by the *Tuscarora*, in 1874.

An island, in lat. 31° 19' N., long. 160° 42' E., is from whaler report.

Sebastian Lopes or *Lobos Island*, in lat. 25° 0' N., long. 158° 0' E., or 154° 0', is only known from the old Spanish charts. The latter position is 45 miles northward of Marcus Island.

Tres Columnas or *Columnas Island* (Spanish charts), in lat. 29° 0' N., long. 160° or 162° E., is not otherwise known. The latter position was crossed by Capt. Lütke.

A reef, in 26° 0' N., 160° 0' E., has not since been found.

Volcan Island, on old authority, in lat. 22° 35' N., long. 160° 0' E.

La Mira or *Laonira*, in lat. 20° 25' N., long. 164° 15' E.; *Camira* (the same name misapplied), in lat. 21° 35' N., long. 160° 0' E., have been given on the authority of the Spanish chart of 1743, but cannot now be recognised.

Decierta Island, in lat. 20° 10' N., long. 165° 20' E.; and another *Decierta*, in lat. 23° 25' N., long. 160° 45' E., are unknown, but are near to Wakes Island, page 1126.

Otra, in 23° 10' N., 157° 0' E., is not known.

in May, 1868. He describes it as a low, level, sandy island, covered with trees and bushes, about 2 or 3 miles long, East and West. No breakers were visible, extending any great distance, from either end; its width was not ascertained. The position of the West end, by a set of sights, was 24° 24' N., 153° 58' E., or 20 miles northward of the reported position of Weeks Island,* and differs from it in not having any knoll in the centre.

According to Commander Belknap, U.S. ship *Tuscarora*, 1874, Marcus Island is about 60 ft. high, and appeared when first seen like a forest of trees rising out of the water. It was found to be in lat. 24° 14' N., long. 154° 0' E. Reefs extend a considerable distance off the East and West ends, and a high white beach, occasionally broken with large black rocks, fringes the shore. The surf was very heavy, and landing seemed impossible on the northern side. Great numbers of birds were flying over the land. Nothing was seen of Weeks Island.

The position of this fertile island is important and reliable; it lies directly in the track of whalers bound from the Carolines to the Sea of Okhotsk.†

MARSHALL ISLANDS (*Los Jardines*?).—Two small islands were discovered, in 1788, by Captain Marshall, of the ship *Scarborough*, whose name

* *Weeks Island*, originally a whaler report, was seen by Captain Gelett, in the *Morning Star*, the Hawaiian mission ship, on December 17th, 1864. He describes it as about 5 miles long, densely covered with trees and shrubbery, with a white sandy beach and a knoll near the centre, rising about 200 feet above the sea, thus differing from the description of Marcus Island. There were no signs of inhabitants on it, and a reef extended to the North of it. Capt. Gelett gave the position as lat. 24° 4' N., long. 151° 2' E., but it seems almost certain that Marcus and Weeks Islands are identical.

† The following are doubtful.

Weeks Island, in lat. 31° 14' N., long. 147° 16' E., a whaler's notice; and a reef, in 31° 18' N., 153° 26' E.; an island, in 31° 0' N., 147° 16' E.; a reef, in 32° N., 147° 20' E.; a reef, announced in the China Mail, in lat. 31° 30' N., long. 154° 0' E.; *Ganges Reef*, in 30° 47' N., long. 154° 20' E.; and three doubtful shoals in 31° 30' N., 153° 0' E.; 31° 18' N., 154° 0' E.; are most probably repetitions of the same report.

Several others, which need not be enumerated, may be included in the foregoing. The commanders of the Pacific Mail steamers disbelieve in their existence. It may be observed that hereabout the strong currents may have caused very bad reckoning, and it is possible that they may refer to the reefs and islets far to the West, lying South of Yedo Gulf. (See pages 841-2.)

Congress Island, in lat. 23° 30' N., long. 148° 0' E., from whaler's report.

Islands, from whaler report, in 25° 10' N., 153° 35' E. A reef, in 25° 28' N., 152° 40' E.

An island, from whaler report, 26° 6' N., 154° 36' E.

A reef, in lat. 20° 42' N., long. 155° 0' E.; and another in 20° 30' N., 153° 10' E., may refer to the same. Nothing more is known.

A reef, in lat. 20° 30' N., long. 152° 50', on the charts, has been several times repeated, and once as a sandy bank, once also in West longitude, which is probably erroneous.

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MARSHALL, MARGARET, AND GRAMPUS ISLANDS. 1127

is given to the archipelago to the eastward. They have been thought to be the same as *Los Buenos Jardines* of Alvaro de Saavedra, in 1529. Another group, called *Los Jardines*, was also discovered by Villalobos, in 1543, but the situation of both of these, (lat. 21° to 22°, long. 153°), must be far away from this part, if even they could be identified. Perhaps it would be better to name them the *Scarborough Islands*. Captain Marshall places them in lat. 21° 40', long. 151° 35' E. By whaler report they are in lat. 20° 50' N., long. 151° 40' E. Nothing further is known of them, and their existence is doubtful.

Margaret Islands (*Malabrigos*), a group of three islands, discovered, in 1773, by Capt. Magee, in lat. 27° 20', long. 145° 45'. They have been considered to be the *Malabrigos* (bad shelter) of Bernard de Torres, in 1543, but there is no possibility of deciding on the point; it is possible that they were the Volcano Islands.*

Grampus Islands were said to have been discovered by Capt. Meares, April 4, 1788. They consist of two islands close together, and a third to the S.W. of them. Their position on Meares' chart is lat. 25° 15' N., long. 146° E., but Krusenstern deduces it from his track as lat. 25° 40', long. 146° 40' E. On the Spanish charts the *Sebastian Lopez Islands* are placed near this position. The position thus assumed is open to every doubt, and a vessel passed near here in 1881, and saw no signs of them. But some whaler reports place a group of islands in lat. 25° 6', long. 145° 44' E., or 143° 44' E.

There are so many reports as to the existence of one or more groups hereabout, although some of them are manifestly erroneous, that it must be believed that there is reason for the assertions. There are no means of fully deciding about them.

* *Margaret Islands*, a whaler report, in 27° 30' N., 145° 40' E., are doubtless intended for Margaret Islands, but it adds nothing to their authenticity. They are probably meant for the Bonin Islands.

† *Tree Island*, lat. 26° 2' N., long. 145° 50' E., is called a group of islands, by whaler report, nearly in this position, and *Three Islands* by another and similar report, and again as a group of islands, a degree farther westward, or long. 143° 44'. It is also placed in 26° N., 146° 15' E.

THE ARZOBISPO OR BONIN ISLANDS.

The Bonin Islands, the next to the northward, consist of three groups or clusters, viz., Bailey group to the South, Beechey group in the centre, and Parry group to the northward, the whole extending in a N. by E. direction from lat. $26^{\circ} 30' N.$ to $27^{\circ} 50' N.$ The climate is excellent, and the soil productive.

At the time of the opening of Japan to commerce, they were made the subject of some remark as to whom they belonged, and therefore a few words respecting this point may not be irrelevant. There can be but little doubt now that they are the Bune Sima, or Bonin Sima, described by Mr. Klaproth and Abel Rémusat, in 1817, as being discovered by the Japanese in 1675.

Krusenstern also states that they correspond well with the Ylas del Arzobispo of a work published in Manila many years previously. By right of discovery, therefore, they belong first to Japan, and in the second place, probably, to Spain; the third visitor has been the subject of dispute.

Captain Coffin, of the *Transit*, of Bristol, in the employ of Messrs. Fisher, Kidd, and Fisher, discovered them September 12th, 1824 (not in 1825, as was stated in this controversy). His nationality and flag have been disputed. He was well known to Mr. Arrowsmith, to whom he communicated his discovery, and other English geographers, who always considered that he was an Englishman.

Commodore Perry, in his correspondence and report to his government, and in his paper, read before the New York Geographical Society, speaks quite dubiously on this point. In the latter part of his work he says that he is an American, but does not allude to the account given by Mr. Reynolds, the projector (unacknowledged) of the United States' Pacific Exploring Expedition.

Capt. Coffin saw the South group in 1824, as stated above, giving the name of Fisher Island to the largest, and Kidd Island to the westernmost; to two others he applied the names of South Island and Pigeon Island, and to the harbour he used he gave his own name. Commodore Perry, U.S.N., in 1854, doing what he so severely deprecates in others, has superseded some of these names, giving his own name to South Island, Plymouth to Kidd Island, and Newport to Coffin Harbour. It may be stated that, among other differences, Capt. Coffin places the islands 70 miles to the eastward. In the following year (1825) Capt. Coffin discovered the central group, and refreshed in Port Lloyd. Kater Island, "a lump of an island" as he calls it, was also discovered at the same time. It was taken possession of for England by Captain (afterwards Admiral) Beechey, who surveyed the group in 1827; at that time there were no signs of the islands ever having been inhabited. They were afterwards visited by Capt. Quin, in H.M.S. *Raleigh*, who stayed here 10 days in August, 1837. They have since been visited by several men-of-war, H.M.S. *Larne*, in

1838, Capt. Collinson, H.M.S. *Enterprise*, in 1851, the U.S. Expedition, in 1854, and others.

It was colonised in 1830 under the direction of Mr. Charlton, our consul at the Sandwich Islands. The white settlers landed at Peel Island June 28th, 1830, under Matteo Mazzaro, by birth a Genoese, and Millichamp, an Englishman.* With them were two Americans and one Dane, besides some natives of Oahu. Millichamp afterwards returned to England. The population at the period of Capt. Collinson's visit amounted to 48. In 1876 they numbered 66.

In 1877, the Japanese government assumed the sovereignty of these islands, and the Japanese settlers are now cultivating coffee, cotton, rice, barley, &c. There are still some British subjects residing here. The Japanese name the islands *Ogasawara sima*.

The Japan Expedition determined the geological character of the group to be volcanic; trappean rocks are the basis of the islands. Streams of lava yet are traceable, and basaltic columns appear. Earthquakes occur twice or thrice a year, and Fort Lloyd, the principal harbour, appears to have been the crater of an ancient volcano, its entrance being a fissure in the cone. The scenery of the island is romantic and beautiful.

When in the vicinity of these islands, the navigator must exercise considerable caution, as the currents, both in direction and force, are uncertain, especially between the islands.

Winds.—From January to March, inclusive, westerly winds prevail, variable between North and South, with occasional calms, the latter month being showery. From April to June easterly winds prevail, variable between N.E. and S.E., with occasional calms; fogs are frequent in June. From July to September easterly winds prevail, variable round to South and sometimes S.W., with occasional calms. In July and August it rains heavily. From October to December northerly winds prevail, variable between N.E. and N.W., and sometimes hauling more to the East or West, in December gales are experienced from N.W. and West.

Capt. Knorr, of the German war-vessel *Hertha*, 1876, states that from October to April the prevailing wind is from the westward, variable between S.W. and N.W., with stormy and rainy weather.

The worst winds are to be expected in October, but typhoons are rarely experienced. During July good weather is expected, and in August rain, but no heavy storms. In the summer land and sea breezes prevail; the weather is generally calm at this season, and when there is a breeze it is most frequently from the S.W.—*Commander Huntington, U.S.S. Alert, 1880.*

* Mazzaro and Millichamp's names appear in another part of the world. They were wrecked with Goodridge on the Crozet Islands, in the Indian Ocean, in March, 1821, and figure in Goodridge's "Robinson Crusoe" account of their solitary residence there.

As before stated, they were surveyed by Captain Beechey in 1827, but the southern group was more particularly examined by Lieut. G. B. Balch, U.S.N., in the *Plymouth*, 1853. From these and later accounts we give the following:—

PARRY GROUP, the northernmost cluster, consists of small islands and pointed rocks, and has much broken ground about it, which renders caution necessary in approaching it. According to the survey it extends about 9 miles in length, N.W. by N. and S.E. by S., its North extremity being in lat. 27° 44' 35" N., long. 142° 7' E.

Kater Island, in lat. 27° 30' N., long. 142° 15' E., is 8 miles southward of the Parry group. It is a small rocky island, about 1½ mile long, N.W. and S.E., with a conspicuous islet, the *Ears*, on its S.W. side, and surrounded by rocks in every direction.

BEECHEY GROUP, the principal cluster of the Bonin Islands, were thus named by the English surveyor. He thus describes it:—

The middle cluster consists of three islands, of which *Peel Island*, 4½ miles in length, is the largest. This group is 9½ miles in length, and is divided by two channels so narrow that they can only be seen when abreast of them. Neither of them is navigable for shipping; the northern on account of rocks which render it impassable even by boats, and the other on account of rapid tides and eddies, which, as there is no anchoring ground, would most likely drift a ship on the rocks. The northern island I named *Stapleton*, and the centre *Buckland*, in compliment to the professor of geology at Oxford. At the S.W. angle of Buckland there is a sandy bay, in which ships will find good anchorage, but they must be careful in bringing up to avoid being carried out of soundings by the current. It is named Walker Bay, after (the late) Mr. Walker, of the Hydrographical Office. The southern cluster is evidently that in which the whale-ship, commanded by Mr. Coffin, anchored in 1823, and he was the first to communicate its position to this country, and bestowed his name upon the port. As the cluster was, however, left without any distinguishing appellation, I named it after Francis Bailey, Esq., late President of the Astronomical Society.

It was visited by the U.S. Japan Expedition, in June, 1853, and the narrative of Dr. Hawkes gives us the best account of the islands. Speaking of the Beechey group, he says:—The islands of Bonin are high, bold, and rocky, and evidently of volcanic formation. They are green with verdure and a full growth of tropical vegetation, crowding up the acclivities of the hills, from the very borders of the shore, which is, here and there, edged with coral reefs. The headlands and detached rocks have been thrown by former convulsions of nature into various grotesque forms, which assume to the eye the shape of castle and tower, and strange animals of monstrous size and hideous form. Numerous canal-like passages were observed opening in the sides of the rocky cliffs, which had almost the appearance of being hewn out with the chisel, but which were evi-

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dently formed in the course of volcanic changes, when the rock flowed with liquid lava, and found issue in these channels, which the torrents that come down the sides of the mountain in the rainy season toward the sea have worn smooth by constant attrition. Some of these dykes, or canal-like passages, less affected by time and the washing of the water, still retain their irregular formation, which has so much the appearance of steps that the observer, as he looks upon them, might fancy they had been cut by the hand of man in the solid rock, for the purpose of climbing the mountain. On the Southern Head, as it is called, within the harbour of Port Lloyd, there is a very curious natural cave or tunnel, which passes through the basaltic rock, from the Southern Head to the beach on the other side. The entrance has a width of about 15 ft., and a height of 30 ft., but the roof within soon rises to 40 or 50 ft., where it has so much the appearance of artificial structure, that it may be likened to a builder's arch, in which even the keystone is observable. There is sufficient water for a boat to pass from one end to the other. There are several other caves or tunnels, one of which is at least 50 yards in length, and passes through a headland bounding the harbour. This is constantly traversed by the canoes of the inhabitants.

The geological formation of the island is trappean, with its various configurations and mineralogical peculiarities; columnar basalt appears, and hornblende and chalcidony are found. There are all the indications of past volcanic action, and the oldest resident of Peel Island stated that two or three tremblings of the earth, giving evidence of a liability to earthquake, are experienced annually even now.

PEEL ISLAND is the principal of the cluster, and on it are two bays, one to the S.E., which is clear and deep, except towards the head, where anchorage may be had; but of course it is open to the prevailing winds. Its head runs nearly up to that of Port Lloyd, which is on the N.W. side of the island, and facing the West.

The island is 4½ miles long, and tolerably high, the hills rising in some places by gentle slopes, in others abruptly by steep ascents; the elevation of the *Paps* near the North end is respectively 879 and 886 ft. Almost every valley has a stream, and the mountains are clothed with trees, among which the *areca cerasosa* and fan palms are conspicuous. The volcanic origin of the island is clearly manifest from the existence of ancient craters, and basaltic dykes passing through beds of sand, scoria, and cinders. In 1876, the inhabitants were 96 in number.

Off the S.W. end of Peel Island is *Knorr Island*, with several islets and rocks in its vicinity, and northward of Knorr Island are the conspicuous *Sail Rocks*, 60 ft. high. At 1½ mile northward of Sail Rocks is the entrance to Port Lloyd.

The promontory stretching from the N.W. end of Peel Island and forming the North and West sides of Port Lloyd, is 739 ft. high towards its centre, and

594 ft. towards its southern end. The seaward shores are bold and perpendicular. Westward (southerly) of the latter summit a reef extends out to the distance of $1\frac{1}{2}$ cable from the shore; and rather more than a cable's length to the northward of this, and at the distance of 2 cables from the shore, is an outlying rocky patch, having only 6 to 8 ft. water on it, with deep water all round. There is also a reef of rocks off the N.W. point of Peel Island.

Port Lloyd.—This small harbour has its entrance conspicuously marked by a bold, high promontory (Southern Head 492 ft. high) on the southern side, and a tall quoin-shaped rock (Square Rock, 260 ft. high) on the northern side. It is nearly surrounded by hills, and it would appear to have been at one time the crater of an active volcano. At the upper part of the port there is a small basin, formed by coral reefs, kept open by streams of water running into it, and which, in consequence of there being 10 fathoms water all over it, is named *Ten-fathom Hole*. It is conveniently adapted for heaving a ship down, and on the whole a most desirable place of resort for a whale-ship. In most of the small bays in the harbour there are coral reefs and ledges. Tidal waves are not uncommon, the water sometimes rising suddenly 7 or 8 ft.

At 2 cables south-eastward from Square Rock, and at 3 cables southward of the rocky head on the North side of the entrance, are the southern edges of two dangerous shoal patches, steep-to, and awash with a smooth sea; they can be easily seen from aloft, however, even when there is no swell on. There is also a coral rock about a cable's length North from the northern point of Southern Head, on which there is 8 ft. water, and there are breakers 3 cables southward of the South side of the same head. Southern Head is an island at high water, and on the slope is a *beacon*, 20 ft. high, surmounted by an open triangle.

Supplies.—Wild hogs and goats can be procured from the inhabitants, together with potatoes, yams, and other vegetables and fruit. Wood is plentiful, and water can be procured in limited quantities; the best watering-place is in *Ten-fathom Hole*, but it is necessary to be cautious of the sharks, which are very numerous. Between January and March quantities of turtle are taken.

Directions for Entering.—Having ascertained the situation of the port, steer boldly in for Southern Head, taking care, when approaching from the southward, not to bring it to the northward of N. 47° E., *true*, nor to shut it in with the two Paps on the N.E. side of the harbour, which will be seen nearly in one with it on this bearing. In this position they are a safe leading-mark. To the southward of this line there is broken ground. Castle Rock, within the harbour, bearing East, leads in.

If the wind be from the southward, which is generally the case in the summer time, a sailing vessel should round the South bluff at the distance of 200 yards, close to the sunken coral rock, which may be distinctly seen in clear weather. Keep fresh way upon the ship, in order that she may shoot on end through the eddy winds, which baffle under the lee of the head; and to prevent her coming

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round against the helm, which would be dangerous. The winds will at first break the ship off, but she will presently come up again; if she does not, be ready to go about, as you will be close upon the reefs to the northward, and put the helm down before the South end of Goat Island, to the north-westward of the entrance of the port, comes on with the West side of Square Rock, to avoid the shoal patches south-eastward of Square Rock.

If she comes up, steer for the high *Castle Rock* at the East end of the harbour, until a pointed rock on the sandy neck to the eastward of Southern Head comes in one with a high sugar-loaf-shaped grassy hill to the southward of it. After which you may bear away for the anchorage, taking care not to open the sugar-loaf again to the westward of the pointed rock; this rock is white on the top with birds' dung, and looks like an island. The best anchorage, Ten-fathom Hole excepted, which it is necessary to warp into, is at the northern part of the harbour, where the anchor is marked on the Admiralty plan, in 18 to 22 fathoms.

In bringing up, take care of a spit which extends off the South end of the small island near Ten-fathom Hole, and not to shoot so far over to the western reef as to bring a rock at the outer foot of Southern Head in one with some black rocks, which will be seen near you to the south-westward. The depth of water will be from 18 to 20 fathoms, clay and sand. If the wind be from the northward, beat between the line of the before-mentioned Sugar-loaf and Pointed Rock westward, and a North and South line from Castle Rock to the eastward. This rock, on the western side, as well as the bluff to the northward of it, may be passed close-to, if necessary. The hand-leads are of very little use in beating in here, as the general depth is 20 or 24 fathoms.

It is high water, on full and change, at 6^h 8^m; springs rise 3 ft. The station on the North side of Ten-fathom Hole is in lat. 27° 5' 35" N., long. 142° 11' 30" E.; some observations place it 4' or 5' farther eastward.

Admiral Collinson, C.B., was here in 1851, and he says, that in making the island from the southward, he experienced a difficulty in discovering the remarkable quoin mentioned by Capt. Beechey as the mark for the harbour on the South side, being under the shadow of the high land at the back. No difficulty, however, can be experienced by a stranger making the harbour from the southward, as the bold bluff on the South side is sufficiently remarkable, and the two paps which Capt. Beechey gives as a leading mark for clearing the rocks outside of the harbour will sufficiently denote its position. Besides that, among the detached rocks to the southward, are two pinnacles, and over the remarkable quoin, on the North side as you enter, is a triple peak. We shot in close under the bluff, but did not see the shoal off it (it will not do, therefore, for vessels to trust to the eye to pick this danger up), and then had baffling winds until we opened South Bay, when we edged away to the North, and came to off the entrance to Ten-fathom Hole in 25 fathoms; a better berth will be found a cable's length closer to the reef on the West side.

Fitton Bay, at the S.E. angle of Peel Island, enclosed by perpendicular rocks, is $1\frac{1}{2}$ mile deep, and nearly a mile wide at the entrance. There is good anchorage at the upper end in 17 fathoms, sand, at the distance of 2 cables from the shore, secure from all winds except those from S.E., which blow generally during the summer. On the North side of the entrance there is a large and conspicuous islet, connected to the North bluff of the bay by a reef on which are several small rocks. Outside the harbour there are also some sunken rocks to the southward of the entrance, on which account ships should not close the land in that direction, so as to shut in the two paps (at the N.E. angle of Port Lloyd) with the South bluff of the bay; with these objects open there is no danger. At the upper end of the bay, on the West side, there is a small and narrow cove, with 6 fathoms water at the entrance. *Fitton Bay* was frequently visited by whalers for wood and water.

From a point near the middle of the East side of Peel Island a reef of rocks stretches to the northward, terminating at a small islet in lat. $27^{\circ} 54' N.$; one-third of a mile to the north-westward of the islet is a detached patch and rock. The channel between Peel and Buckland Island, to the northward, is unsafe. Nearly fronting this channel, 1 mile westward of the West entrance, is *Goat Island*, in lat. $27^{\circ} 7' N.$, about 300 ft. high, in the vicinity of which are several rocks and small islets; one-third of a mile to the southward of Goat Island there is also a small group of very low islets.

Buckland Island, to the North of Peel Island, and the central one of Beechey group, is $3\frac{1}{2}$ miles long, N.W. and S.E. At the S.W. angle of the island, close to the opening of the channel between it and Peel Island, is a small sandy bight named *Walker Bay*, in which ships will find good anchorage; but they must be careful in bringing up, to avoid being carried out of soundings by the current. Deer are said to be found here. The islet on the West side of this bay is connected to the main by the reef. Westward of the West point of Buckland Island, and five-eighths of a mile north-westward of the islet just mentioned, is *Little Goat Island*, which is also connected to the main by a reef. The channel between Goat Island and Little Goat Island is over half a mile wide, and safe by not borrowing too much towards either shore.

Stapleton Island, the northernmost of the Beechey group, is, like the others, of volcanic origin. It has a varied surface of plain, hill, and valley, with large tracts of fertile land, where coffee is now cultivated. There is a small bay on the western side with apparently deep water, and surrounded by rocks and mountains, the latter varying from 800 to 1,500 ft. in height, which protect it from the S.E. typhoons. A small promontory divides the bay, and on the land bordering the North part is a spring of good water, issuing from a rock. There are a great many wild goats, and the same supplies may be procured as at Peel Island.

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by Capt. Beechey, in 1827. The respective islands of the cluster were named by their discoverer, Capt. Coffin, as hereafter stated. "With the proverbial modesty and justice of . . . surveyors, Commodore Perry replaced the original names by his own for the southernmost, and of his officers to the others."

Fisher Island was named by Coffin in 1823, after one of his employers. It is called *Hillsborough Island* by Commodore Perry. A survey was made by Lieut. G. B. Balch, U.S.N., in 1853. He of course uses the *new* names applied by the surveyors. In taking his descriptions we have restored the original names, adding the recent ones in parentheses.

Fisher Island, the largest of the Coffin group, is $7\frac{1}{2}$ miles in length, N.N.W. and S.S.E., by about $1\frac{1}{2}$ mile in breadth, and 1,471 ft. high. The greater portion of it is rocky and hilly, and unsuited for agricultural purposes. That portion of it which could be cultivated is a black loam, and produces sweet potatoes, yams, taro, and Indian corn, bananas, pine-apples, water melons, and limes. Sweet potatoes form the staple support of the few inhabitants of the island. Hump-back whales resort to these islands from November till May, during which time they are calving. Turtles are found in abundance in season, and are salted down by the inhabitants in lieu of beef. There are some wild hogs on the island.

Close to the northernmost point of *Fisher Island* is *Devil Rock*, from which a reef stretches nearly a mile to the north-westward. At three-quarters of a mile south-westward of the rock is the N.W. point of the island, off which is *Sugar-loaf Rock*, with dangerous rocks and reefs stretching some distance seaward. On the West side of the island, midway between its extreme points, are two small indentations in the coast-line, off which are two small islets. Half a mile to the southward of the southern indentation is *Pyramid Rock*, close to the shore; nearly a mile south-westward from the Pyramid is *Painted Rock*, three-quarters of a mile from the coast, the intervening area being encumbered by rocks (one of which is arched) and by reefs; these form part of the northern boundary of *Coffin Harbour* (New-port), an open bay on the West side of *Fisher Island*, near its South end.

Stretching to the south-westward from the S.W. point of *Fisher Island* is a continuous line of reefs and islets, terminating in a long but narrow island. The outermost extreme of this island, with its outlying reefs, is $2\frac{1}{2}$ miles from the S.W. point of *Fisher Island*; thence a rocky patch trends to the north-westward, in the direction towards *Mid-channel Rock*, which rock is also surrounded by rocky patches; half a mile to the northward of *Mid-channel Rock* is *Kidd* (Plymouth) *Island*, which is a mile long, N.N.E. and S.S.W., and half a mile wide. *Kidd Island* fronts and partially shelters *Coffin Harbour* (New-port); the channel between it and the main island (*Fisher*) on the North is deep, and $1\frac{1}{2}$ mile wide; that to the South, between *Kidd Island* and *Mid-channel Rock*, is less than half a mile in width, but safe (having 10 fathoms)

by not borrowing too much towards the rock. Whether the channel between Mid-channel Rock and the island to the south-eastward is accessible is uncertain; it appears by the chart to be considerably encumbered with rocky patches which narrow the passage.

To the S.S.E. of Fisher Island, at the distance of 3 miles, is *Kelly Island*, 1 mile long, East and West, and half a mile wide. To the north-eastward of Kelly Island, at the distance of half a mile, is another small island, with a reef off its East extremity. Several islets and a reef of rocks also stretch some distance northward from the N.W. point of Kelly Island to the centre of the easternmost island, making the channel between the two impassable. Off the West end of Kelly Island there is a small rock, and the depth is 25 fathoms.

West of Kelly Island, at the distance of 2 miles, is *South (Perry) Island*, 1½ mile long, N.E. and S.W., and about half a mile wide. The channel between South Island and the island to the North is a mile wide; the islets (*Needles*) in the channel near the North side of South Island have rocky patches around them; there is also a rocky patch three-quarters of a mile south-eastward from South Island, opposite two rocks near the shore.

Coffin Harbour.—With the exception of this and a small cove just to the northward of it, there is no place on the shores of any of the islands suitable for a coal depot; nor can either be recommended as places suitable for such a purpose. They are both open from S.W. to N.W., and the holding-ground is not good, being sand and rocks. Vessels could, however, always get to sea on the approach of a gale, as there are two safe passages, which are very plain. In the centre of the harbour there appears to be no bottom with 24 fathoms. The *Plymouth* anchored in 14 fathoms, about half a mile from the head. Wood and water may be procured here, the latter from a small stream near the head.

It is high water, in Coffin Harbour, on full and change, at 11^h 32^m, and the rise of tide is 3½ feet.

VOLCANO ISLANDS.

This remarkable group of three islands lies to the southward of the Bonin Islands, at from 85 to 140 miles distant, and forms a continuation of that line of volcanic fires which show themselves at intervals from Kamchatka southward, through the eastern part of Japan, and the range of islets to the S.E. of Nipon, and then in the Bonin Islands.

These three islands were discovered, in 1543, by Bernardo de Torres, and received their name from the volcano on the central one. There can be no doubt of their being the same as the *Sulphur Islands* of Capt. King, in 1779. They were also seen by Capt. Krusenstern, in the *Naditjeda*, in 1805. On the

Spanish charts the northern island is called *San Alessandro*; the centre, *Sulphur Island*; and the southern, *San Augustino*. Espiñosa says that the southernmost was seen in 1804, by the Spanish corvette *La Concepcion*, and named *San Dionisio*, a name by which, according to him, it has always been distinguished by the Spanish navigators.

San Augustino (or *San Dionisio*), the southernmost, is a single mountain of a square form, flat at the top, about 1 mile in extent, and 3,039 feet high. Admiral Krusenstern's observations (and he was near it for two days) place it in lat. $24^{\circ} 14'$, long. $141^{\circ} 20'$, which is $7' 30''$ South of that given by Captain King; so that unless a fourth island lies in that latitude, a thing most improbable, we must suppose that the error arose from the distance at which it was seen in 1779.

Sulphur Island, the central one, is about 5 miles long, E.N.E. and W.S.W., its centre being in lat. $24^{\circ} 46' N.$, long. $141^{\circ} 19' E.$ The South point is a high, barren hill, 644 ft. high, flattish at the top, and when seen from the W.S.W. presents an evident volcanic crater; the soil of which its surface is composed exhibited various colours, and a considerable part of it was conjectured to be sulphur, both from its appearance and the strong sulphureous smell perceived as the point was approached. Some on board the *Discovery* thought they saw steam rising from the top of the hill. A low, narrow neck of land connects this hill with the South end of the island, which spreads out into a circumference of 9 to 12 miles, and is of moderate height. Smoke or steam was noticed issuing from the ground on the northern end. The part near the isthmus has some bushes on it, and had a green appearance, but that to the N.E. is very barren and full of large detached rocks, many of them exceedingly white. Very dangerous breakers extend $2\frac{1}{2}$ miles to the East, and from a half to $1\frac{1}{2}$ mile to the West, off the middle part of the island, on which the sea breaks with great violence. The position of Sulphur Island, according to Capt. King, identical with that of Admiral Krusenstern, is lat. $24^{\circ} 48'$, long. $141^{\circ} 18'$.

From Sulphur Island, both *San Alessandro* and *San Augustino* Islands were plainly seen, and appeared exactly alike; viewed from this position, they are perfect cones. From the North, *San Alessandro* does not appear conical, and the high western end has a rounded outline.

San Alessandro, the North island, is 2,534 ft. in height, 2 miles in length, North and South, and 1 mile broad, and, when viewed from the southward, appears as a single mountain; its conical peak, or crater, is in lat. $25^{\circ} 24' 54'' N.$, long. $141^{\circ} 15' 45'' E.$, according to observations on the U.S. ship *Alert*, 1880. Landing may be effected on the S.W. end. The island is steep-to on its northern and eastern sides, but a depth of 40 fathoms is found at a mile from its South end. Soundings of varying depths are also obtained on its western side, where the bottom appears to be very uneven.

North Pacific.

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At 1½ mile W. ½ N. from the North extremity of San Alessandro Island, a submarine volcano was observed from the *Alert*. Masses of mud and ashes were being upheaved, accompanied by dull reports, and a strong odour of sulphur. Depths of 10 to 20 fathoms were found at half a mile South of this reef, or island, in process of formation, and there is a patch of 5 fathoms 7½ cables S.E. from it. At night flames were noticed issuing from the volcano. The *Alert* revisited the spot in May, 1881; at this time it was not in action, but the position was marked by a crescent-shaped patch of discoloured water three-quarters of a mile long.

From these islands the volcanic energies appear to diverge into several directions to the S.S.E. towards the Mariana Islands, well known as a range of volcanic summits, the intervening space being marked with two or three small reefs, whose positions, however, are open to some doubt.*

It also appears to continue to the southward, towards the Pelew Isles, for on December 25, 1848, Mr. Lindsay, of the schooner *Amelia*, discovered an apparently volcanic island or rock, in lat. 19° 20' N., long. 141° 15' E., which could not be found by the *Alert*, 1881 (see p. 1060). To the S.W. there are evidences of submarine volcanic action in the rock "like a sail," seen by the lieutenant commanding the *Euphrosyne*, May 2, 1851, and by the commander of the *Linda*, also in 1851; lat. 21° 43', long. 138° 30' E. Beyond this we have the dangerous Vela, Pareco Vela, or Douglas or Bishop Rock—two shoals often announced as fresh discoveries, and a rock discovered by Meares of furdangling notoriety. A singular phenomenon was experienced by Lieut. Jones, commanding the U.S. sloop-of-war *St. Mary's*, in January, 1850: when in lat. 20° 56' N., long. 134° 45' E., the wind suddenly died away, the sea became troubled, the air heated, and a sulphureous smell became very apparent. This lasted about 25 minutes, and then the wind came out as before.

These last are further alluded to presently.

Forfana Island is said by Galvaom to have been discovered by the ship *San Juan*, in 1543. There cannot be any doubt of its existence, though the position may be open to question. It is said to be 30 leagues E. ½ N. of the Volcano Islands. This would give it lat. 25° 34', long. 143° 0', but it has not been found here.

An island, in lat. 25° 43' N., long. 140° 43½' E., was seen in 1877 from the U.S. ship *Alert*, which it was thought might be Forfana or Arzobispo Island,

* To the southward of the Volcano Islands are the following doubtful announcements:—

A reef, from whaler report, is twice announced as in mean lat. 22° 6' N., long. 142° 27' E. The U.S. ship *Alert* saw no indications of danger in this locality.

Pera, *Pareco*, or *Three Islands*, in lat. 21° 20' N., long. 141° 40' E., may be Euphrosyne Rock.

Valetta Reef, lat. 21° 6' N., long. 143° 0' E., is not known.

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but when the *Alert* revisited the locality in 1880, it could not be seen, and no bottom could be found at 120 to 140 fathoms.

DISAPPOINTMENT or **Rosario Island** lies about 70 miles to the westward of the Bonin Islands. It was seen and named in the *Nautilus*, in 1801, and again on September 23, 1813, in the Spanish corvette *La Fidelidad*. It was also seen by Capt. M. Quin, in H.M.S. *Raleigh*, August 11, 1837, in lat. 27° 13' N., long. 140° 46' E. Commodore Perry, U.S. Japan Expedition, places it in 27° 15' N., 140° 56' 30" E., or mean 27° 14' N., 140° 52' 15" E.

The island is about three-quarters of a mile long, N.E. by N. and S.W. by S., and the highest point, near the centre, 148 ft. Around it are several detached rocks, two of which are a short distance off its extreme points; and a reef extends one-eighth of a mile to the southward of the southernmost one. It is of volcanic formation, bold, broken, rugged, generally barren, and apparently unsuceptible of cultivation, but there are some small patches of green about the top. The surf breaks heavily all around it, and landing is impracticable. From a distance of 10 miles it appears as two islands.

LINDA or **EUPHROSYNE ROCK** is a remarkable pinnacle, seen by the *Linda* and the *Euphrosyne* in 1851. It was on each occasion said to look like a ship under sail. The mean lat. is 21° 43½' N., long. 140° 50' E., but this position requires to be verified. It was not found by the *Alert*, 1881.

Meares Reef is said to lie in lat. 21° 0' N., long. 136° 45' E.

DOUGLAS REEF, or Parece Vela.—Douglas Reef was discovered on September 15th, 1789, by Capt. Douglas, and is described as 5 miles in extent, in a W.N.W. and E.S.E. direction, in lat. 20° 37' N., long. 136° 10'. These rocks, and those seen by Capt. Bishop, in the *Nautilus*, in 1796, in lat. 20° 15', long. 136° 54', are probably the same as those named Parece Vela and Vela, by the older Spanish navigators. The rocks seen by the *Nautilus*, like all bare rocks, appeared like a vessel under sail, and thus might have been called Vela (a sail), or Parece Vela (a sail in sight!). On Anson's chart these hold the same relative position as the Douglas and Nautilus Reefs, and therefore the name of Parece Vela has been added to the discovery of Capt. Douglas, and Vela to that of Capt. Bishop.

An American discovery has been announced as lying half a degree to the North of Douglas Reef; but its true character and position have been well ascertained. Capt. B. Sproule, of the *Maria*, examined it in his boat, March 18, 1847. He says:—I found it to consist of a narrow perpendicular wall of coral, enclosing an oblong lagoon of deep water. I rowed along its whole length, which I should say was 2 miles by three-quarters of a mile wide at one-third from the eastern point. Sharp heads of pointed coral appeared frequently

through the surf; and one isolated rock, about 12 ft. high and 15 ft. broad, rose from the smooth water of the lagoon, near its western extreme, with the rock bearing N.N.E. I put the boat through a narrow channel in the reef of not more than 3 ft.;—this was the only opening I saw, and, had it not been very still under the lee, this would never have shown. High breakers were rolling over the northern and north-eastern parts. When the boat was on the wall I had 3 ft. water; by backing two lengths, 17 fathoms; two lengths more, no bottom with a whole line. The South side is nearly straight, in an E. by S. $\frac{1}{2}$ S. and W. by N. $\frac{1}{2}$ N. direction. The rock, when seen from the ship, 3 miles off, appeared exactly like a boat's tanned lug. Its position is lat. 20° 31' N., long. 136° 6' E. Nothing can be more dangerous than this reef, from its extent; its neighbourhood ought to be approached with the greatest caution in dark and blowing weather; and in the months of November, December, January, and part of February, it blows very hard with thick weather; but, in fact, all the passage from the Sandwich Islands to the coast of China requires the greatest caution. Innumerable sperm whales were playing about the reef, and the sea was perfectly alive with fish of many descriptions. Sharks were also very numerous.—*Nautical Magazine*, 1848, p. 242.

It was also seen by Capt. Steele, of the *Sebastian Cabot*, in 1867, as a reef extending in a W.N.W. and E.S.E. direction for 5 miles. There are two isolated rocks near its western end; the westernmost about 20 ft., and the other about 15 ft. above water, distant from each other about a quarter of a mile. It is a very dangerous reef in stormy or cloudy weather, as it can be seen but a very short distance; the position of the westernmost rock is about lat. 20° 28' N., long. 136° 17' E.

Captain Ludwig Saabye, of the *Benjamin Howard*, saw it and the breakers plainly from the deck, distant about 6 miles. He considered it very dangerous. Lat. 20° 25' N., long. 136° 2' E., from good observations.

The probably correct position will, therefore, be about 20° 30' N., long. 136° 10' E.*

Kendrick Island was seen by an English captain of that name. It is low, and about 6 miles long; lat. 24° 35', long. 134° 0' E. A small, low island was seen by the brig *Hannah Cheever*, in lat. 24° 33', long. 132° 40', about midway between the foregoing and Rasa Island. It may refer to either, or it is possible that there may be but one island. It may be the same as *Dolores Island*, in lat. 23° 50' N., long. 134° 12' E., or lat. 24° 50', long. 134° 15'. The German

* At about 90 miles W. by N. from this the submarine volcanic evidences noticed on page 1138 were felt in 1850.

Bishop, *Nautilus*, or *Vela Rocks*, were discovered by Captain Bishop, in the *Nautilus*, in 1796. They do not appear to have been seen since. Lat. 25° 20', long. 131° 16'. Lieut. Rodgers, U. S. N., passed over this position, and saw nothing of them.

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ic evidences noticed on hop, in the *Nautilus*, in long. 131° 15'. Lieut. m.

vessel *Vineta* searched in the latter position, and no indication of land or shoal water could be seen.

RASA ISLAND is a small, low island, covered with bushes, surrounded with rocks, and said to be 4 or 5 miles long in a N.W. and S.E. direction. It was called *Rasa* (flat) on board the Spanish frigate *Magellan*, in 1815, but it had been seen in 1807 by the French frigate *La Canonnière*. The lat. given was 24° 26' 40", and the mean of the two longitudes 130° 40' E. It has been also seen by several others. Of these may be noticed Mr. Symington, in the *Lancashire Witch*, in 1856, who places it in 24° 26' N., long. 131° 54' E. Captain Dixon, of the *Joseph Sprett*, says that it is 3½ miles long, S.S.W. and N.N.E., generally low, the highest part about 220 ft. high, covered with very short brushwood, and having very deep water all along its western side; lat. 24° 30' N., long. 131° 11' 45" E. Besides these accordant statements may be added the report of Capt. Norville, of the brig *Argyle*, who says that it is a mile long, with a reef projecting from its northern side nearly a mile, and a rock to the East near the shore, lat. 24° 23' N., long. 131° 0' E. The barque *Aurora* says it is 5 miles long, North and South, lat. 24° 29' N., long. 131° 12' E. The mean of these positions may be taken as 24° 27' N., long. 131° 1' 50" E.

Capt. Knorr, German corvette *Hertha*, 1876, places it in lat. 24° 28', long. 131° 26', and states that it is 2½ miles long, N.E. and S.W., with steep shores, particularly on the N.W. side, where the sea breaks heavily.

BORODINO ISLES were discovered by Lieut. Ponafidin, in 1820. He places them in lat. 25° 56', long. 131° 15'. They were surveyed by Commodore Perry, of the U.S. Japan Expedition, in June, 1854. They were found to be two in number, situated 5 miles apart, N.N.E. and S.S.W. The southernmost, the centre of which is in lat. 25° 52½' N., long. 131° 12½' E., is the largest, about 4 miles in extent, East and West, with a reef extending along its South shore. The North island is 3 miles in length, with a rise near the North end gradually sloping towards the sea.

They appeared to be of coral formation, but of great antiquity, as trees of considerable size crowned the uplands, the most elevated part of which may have been 40 ft. above the level of the sea. The navigation in the immediate neighbourhood seemed free of danger, but no indentations were seen in the surrounding shore which might afford safe anchoring-places. No signs of people were discovered, and it is presumed that the islands are uninhabited.*

* The following will conclude the list of doubtful islands:

South Rowan Island, a whaler report, in lat. 27° 4' N., long. 139° 50' E., is doubtless intended for Rosario Island to the eastward.

Rosa Island, a whaler report, in lat. 24° 26' N., long. 138° 56' E., is not known; it may be an error for long. 130° 56' E., and so refer to *Raca Island*, which is probable.

ISLANDS SOUTH-WEST OF JAPAN.

On page 784 we have given descriptions of the south-western coasts of Kiusiu and of Satano misaki or Cape Chichakoff. The islands southward of it have been partially examined by French officers, and adapted to the Japanese charts and names.

TANEGA SIMA, the largest island to the S.E. off this cape, is 32 miles long, N.N.E. and S.S.W., but little is known of it. It is said to be level and covered with trees. The North end is in lat. $30^{\circ} 50' N.$, long. $131^{\circ} 3' 30'' E.$, and a heavy tide-race extends some distance off it. The northern part is low, with smooth, rounded, undulating hills; the centre and southern end is more elevated, the highest peak being 1,200 ft. high. On its N.W. side is a small bay, where a vessel of moderate size may anchor, in 8 or 9 fathoms, sandy bottom.

Off the S.E. point is a conspicuous detached rock, 80 ft. high. Mr. A. F. Boxer, H.M.S. *Hesper*, 1865, reported a shoal of 8 fathoms as lying nearly 7 miles from this point, and in 1872 the *Malvern* passed this shoal, and heavy breakers were observed about 2 miles to the N.N.W. of it. To clear these dangers, the South point of Yakuno sima should not be brought westward of W. by N. until the high rock off the S.E. point of Tanega bears N. $\frac{1}{2}$ W. This reef has been inserted on the charts 5 miles South of S.E. rock, but its position is very uncertain.

Capt. Mills, of the ship *Malvern*, 1872, reported having seen heavy breakers on the South side of Vincennes Strait, from which the South point of Tanega sima bore N. $\frac{1}{2}$ E., and the South point of Yakuno sima West.

Vincennes Strait, between Yakuno sima and Tanega sima, is 10 miles wide in the narrowest part; caution is necessary in approaching the positions of the above-reported shoals.

Mage no sima, 5 miles off the N.W. side of Tanega sima, is a shelving island, with a summit 256 ft. high. Its shores are rocky, but it is well covered with grass, and is used as a rearing establishment for cattle and deer. At about the middle of the East side is a clump of trees, near which are a few huts.

A reef, in lat. $23^{\circ} 20'$, long. $131^{\circ} 15' E.$

Akin Reef or Shoal, reported by Captain Akin, of the ship *Winthrop*, to be a mile long, N.E. and S.W., with but few breakers on it in fine weather. Lat. $29^{\circ} 37' N.$, long. $132^{\circ} 2' E.$ It should be observed that several well-known ships have passed over its position.

A shoal, in $26^{\circ} 55' N.$, $131^{\circ} 36' E.$, was not found by Capt. Marsh, of the *Viscount Sanlon*, in 1851.

Abreogo, lat. $22^{\circ} 0' N.$, long. $129^{\circ} 15' E.$, from the old Spanish chart, has not been found. An island was reported near this position by a whaling vessel, in $129^{\circ} E.$; the German vessel *Vineta* sailed over this position.

Amsterdam Island, $25^{\circ} 25' N.$, $131^{\circ} 0' E.$, may be Borodino Island,

The island should be approached with caution, and if intending to anchor off the East end (the only convenient anchorage), keep well clear of the land until the summit bears S.W. by W., not bringing it southward of that bearing, to avoid the reefs which extend $2\frac{1}{2}$ to 3 cables from its N.E. extreme. Anchorage will be found in 7 fathoms, well sheltered from westerly winds, with the village bearing about W. by S. $\frac{1}{4}$ S.*

YAKUNO SIMA is about 15 miles in diameter; its highest peak, *Mount Motomi*, is 6,345 ft. high, in lat. $30^{\circ} 20' N.$, long. $130^{\circ} 31' E.$, and shows double from the eastward. The island has not been closely examined.

Nagarobs, or *Yerabu sima (Julie Island)*, 7 miles north-westward of Yakuno sima, has an active volcano, 2,067 ft. above the sea. Its highest peak, 2,297 feet, near the S.E. end, is in lat. $30^{\circ} 27' N.$, long. $130^{\circ} 14' E.$ The island is about 6 miles long, E.S.E. and W.N.W., and its greatest breadth is 3 miles.

Take sima (Apollos Island), in lat. $30^{\circ} 48\frac{1}{2}' N.$, long. $130^{\circ} 26\frac{1}{2}' E.$, is $2\frac{3}{4}$ miles long, E.N.E. and W.S.W., and about 1 mile wide; its summit, 742 ft. high, being on the N.E. side. Its West point rises to a conical hill 244 ft. high, and the whole island is covered with bamboo.

Sunken rocks extend a short distance off most of the points, and a rocky spit extends $2\frac{1}{2}$ cables from its East extremity. The inhabitants haul their boats up in a small indentation on the North side of the island. With northerly winds there is another landing-place on the South side. Indifferent anchorage may be obtained in the small bight, in 13 to 14 fathoms, sand, shells, coral, and rock. H.M.S. *Sylvia* anchored in 12 fathoms under the S.E. end of the island, but this anchorage is not recommended.

Iwo ga sima (Volcano Island), 4 miles westward of Take sima, is 3 miles long, East and West, $1\frac{1}{2}$ mile across, and its summit, an active volcano, is 2,331 ft. above the sea, in lat. $30^{\circ} 47' 15'' N.$, long. $130^{\circ} 18' E.$ A small portion on the western side is under cultivation. The West coast rises precipitously, and thence extends as a moderately level plateau for a short distance to the base of the bamboo-covered hills. Fish is abundant. Large quantities of sulphur are collected and sent to Kagosima. Some rocks and reefs extend about three-quarters of a mile north-eastward from the N.E. point, and on this reef is *Pinnacle Rock*, 65 ft. high. Two rocks, *Asashi*, 50 to 60 ft. high, lie about half a mile southward from the S.E. point. On the South side of the island is a snug little creek, at the head of which is a small village, but the water is too deep to anchor in; two sunken rocks lie a cable off its West point.

Yakuro, Kowose, or Powhattan Reef.—This dangerous reef, in lat. $30^{\circ} 42' N.$, long. $130^{\circ} 19' E.$, was discovered by the U.S. frigate *Powhattan*, in January, 1860. The greater part of the reef (about 3 cables in extent) is above water,

* *Seriphos*, or *Omuru Rock*, was marked as under water, in lat. $30^{\circ} 44' N.$, long. $130^{\circ} 45' E.$, about 5 miles westward of *Mage no sima*, but it does not appear on the latest charts.

and the centre rock, 22 ft. high, lies $2\frac{1}{2}$ miles S. $\frac{1}{2}$ W. from Asashi. From it the S.W. point of Iwoga sima bore N.W., the East point N. $\frac{1}{2}$ W., and the East point of Take sima N.E. $\frac{1}{2}$ N.

Other rocks were seen awash, or a few feet above water, stretching out about three-quarters of a mile from the centre rock.

Use, or *Trio Rocks*, lying W. $\frac{3}{4}$ S., 18 miles from Iwoga sima, and S.E. by E., $8\frac{1}{2}$ miles from Kuro sima, are three distinct islets, the centre islet, 178 ft. high, being in lat. $30^{\circ} 45' N.$, long. $130^{\circ} 7' E.$ From the eastward and westward they are in line, and appear as a solid tower. The western rock is also 178 ft. high, the eastern 155 ft., and there is a fourth rock, 7 ft. in height, lying $1\frac{1}{2}$ cable to the eastward of the others; the whole group occupying a space of a little over 2 cables. There is deep water close to them on all sides.

KURO SIMA, or *Santa Clara*, 16 miles W. by N. from Iwoga sima, is about 3 miles long, East and West, and $2\frac{1}{2}$ miles broad, its summit, near the centre, rising to a height of 2,028 ft., in lat. $30^{\circ} 49\frac{1}{2}' N.$, long. $129^{\circ} 56' E.$ Its shores are steep and rocky, except at the West point. Shelter from S.W. or southerly winds may be obtained in 12 fathoms, sand and shells, off a small village, in a small indentation immediately West of the East point. Off the East point is a pinnacle rock, 165 ft. high. Earthquakes are often felt at Kuro sima, and it is frequently visited by hurricanes.*

Kusakaki sima, *Ingersoll*, *Morrison*, or *Lorne Rocks*.—This cluster of remarkable islands, rising steeply on all sides, extends a little over 3 miles, N.E. and S.W., but only a quarter of a mile wide. The largest island is 530 ft. high, the summit being 1 mile from the southern point of the group, in lat. $30^{\circ} 50' N.$, long. $129^{\circ} 26' E.$ The eastern island is 445 ft. high, and on its East side are a few huts used by fishermen.

The channel between the two easternmost islands should only be used in cases of emergency. The tides appear regular, the flood flowing to the northward, and the ebb southward.—*Lieut. Pearce*, H.M.S. *Sylvia*, 1870.

THE LINSCHOTEN ISLANDS.

This volcanic group, consisting of twelve islands and rocks, some of which are inhabited, extends 120 miles S.W. of Yakimo sima. There appear to be many safe channels between them, but the mariner is cautioned not to place too much dependence either on their configurations or positions as shown on the chart, for they are by no means correct.

* This small and lofty island was one of the marks used by the "Portingales" in sailing from Macao to "Langasquo" (Nagasaki) in early days. It is frequently mentioned by Linschoten (anno 1596), and marks are given to distinguish it from Meac-sima (Asaka Irima), the other landfall.

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They were entirely omitted on modern charts, but they are clearly shown in the illustration to the third book of the "Voyage ofte Schipvaert van Jan Huygen van Linschoten" (of Enkhuyzen), published at Amsterdam in 1595-6. Several particulars of the adjacent islands are given in this work, but there was some difficulty in applying them. In August, 1845, Sir Edw. Belcher, H.M.S. *Samarang*, first brought them to notice again. On August 13th, he landed on one of these *terra incognita*, the same on the 14th, and met with a disaster. The islands were (nearly) all named and placed on his charts.

Contre-Amiral Cécille examined them in the French corvette, *La Sabine*, and he gave them a second set of names, calling the range the *Cécille Archipelago*. The native names have been ascertained, and thus they possess three distinct sets of designations, which, for distinction sake, we must repeat here. The first the native, the second the English, the third the French.

Colnett Strait, which separates the Linschoten group from the group to the northward, appears preferable to Van Diemen Strait for vessels bound from China to Japan. Yakuno sima, being lofty and steep-to, is an excellent mark; besides which, better weather is generally experienced in this strait than in the latter. *Medusa Reef*, reported by the commander of the Dutch war-steamer *Medusa*, 1864, as being indicated by discoloured water and high breakers, 2 miles in extent, North and South, and lying 8 miles northward of Firase, has not since been noticed.

Firase (*Blake Reef* or *Lapelin Rocks*) consists of several islets and rocks, extending about 3 miles in a N.E. and S.W. direction; the highest islet, 92 feet above the sea, is in lat. 30° 4' N., long. 130° 3' E.

Kutsino sima (*Jerabout* or *Alemène*) is 4 miles long, N.N.W. and S.S.E.; its peak, elevated 2,230 ft. above the sea, is in lat. 29° 59' N., long. 129° 56' E. *Henty Reef*, about 2 cables in extent, on which the sea was seen breaking heavily, was reported, in 1872, to lie N.W. $\frac{1}{2}$ N., $3\frac{1}{2}$ miles from the North point of Kutsino sima.

Kohebi sima (*Forgeade Rock*), rising 996 ft. above the sea, is in lat. 29° 53' N., long. 129° 38' E.

Hebi sima (*Dundas* or *St. Xavier*), $3\frac{1}{2}$ miles north-westward of Kohebi sima, rises to the height of 1,687 ft., the peak being in lat. 29° 54' N., long. 129° 33' E. There is a small islet off its N.W. face.

NAKA SIMA (*Pinnacle* or *Pacifique*) rises 3,400 ft. above the sea, its peak, an active volcano, being in lat. 29° 52' N., long. 129° 52½' E. It is 5 miles long, N.W. and S.E., and 3 miles wide. Off its South and S.E. sides are two islets, about 85 ft. high. A reef is said to lie between it and Kutsino sima.

Fira sima (*Disaster* or *Victorieuse*), lying 8 miles W.N.W. of Suwa sima, is 812 ft. high, and in lat. 29° 41' N., long. 129° 32½' E.

SUWA SIMA (*Volcano* or *Archimède*) is an active volcano, 2,706 ft. high, in lat. 29° 38' N., long. 129° 42' E. It is about 5 miles long, and 3 miles wide.

North Pacific.

Akuisi sima (*Samarang* or *Acoucheki*), rising 1,978 ft. above the sea, is in lat. 29° 27' N., long. 129° 37½' E. It is 4 miles long, East and West, the shores being generally steep and inaccessible, except at one place, where there appears to be some cultivated land; the West end is bold, high, and thickly wooded. A small islet lies off its N.W. face.

Simago (*Cooper* or *Sabine* group) are four small islets, the highest of which, 372 ft. above the sea, is in lat. 29° 13' N., long. 129° 20½' E. The easternmost islet bears from it about E. ½ N., 3 miles.

TOKARA SIMA (*Pennell* or *Toukara*), 860 ft. above the sea, is in lat. 29° 8' N., long. 129° 13½' E. It is inhabited, and the North end is cultivated. Several rocks and islets lie off its S.W., East, and S.E. sides.

YOKO SIMA (*Oyle* or *Cléopatre*), rising to the height of 1,700 ft. above the sea, is an extinct volcano, the highest part of which is in lat. 28° 48' N., long. 129° 2' E. *Kaminone*, or *Royalist Island*, a small islet, about 1½ mile northward of it, is 972 ft. high, and volcanic; two islets lie off its West side.

LU-CHU, LIU-KIU, OR LOO-CHOO ISLANDS.

This group of very irregularly-formed islands succeeds the *Linschoten* group to the southward, and belongs to Japan. It consists of three large islands, *Amami Og sima* to the N.E., *Kakirouma* in the centre, and *Okinawa sima* to the S.W., with numerous smaller islands and rocks in their vicinity. The charts are derived from the Japanese chart, published by P. Von Siebold, in 1852, and therefore must not be implicitly depended on. They have been frequently visited and described, especially by Capt. Basil Hall, who gives a long account of them; by Captain Beechey (*Voyage of the Blossom*, vol. ii., chap. xvii.); and Sir Edward Belcher (*Voyage of the Samarang*, vol. ii.)

Mr. J. A. Gubbins, of the British Consular Service in Japan, states that according to the census of 1875 the population was 165,930, the area being rather less than 1,000 square miles. The imports from Japan are chiefly rice, cotton thread, and provisions; sugar holds the first place on the list of exports, cloth coming next. The weights and measures are based on those of Japan, and the currency consists of old copper cash. The language spoken is closely allied to Japanese.*

The natives are a very intelligent-looking and apparently healthy people, and in disposition are mild and kind. In general appearance they resemble

* From an interesting communication, printed in the *Society of Arts Journal*, vol. XLV., 1881, page 596, &c.

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the Malays, though they are of a lighter hue. Their dress is similar to that of the Japanese. There are no arms of any kind on the islands at present, and the little kingdom has enjoyed the blessings of peace for many centuries. The products of the islands are few, and consist principally of sugar, cotton, and sweet potatoes. The chief imports from Japan are rice and tea.—*Proceedings of the Royal Geographical Society*, 1879, pp. 211—212.

Winds.—The Lu-chu and Linschoten Islands lie on the edge of the region of the N.E. monsoon, but within the limits of the S.W. monsoon; the climate is mild. From January to March, northerly winds prevail, variable between N.W. and N.E. In April the wind is variable from the southward and eastward; in May and June the S.W. monsoon is steady and moderate, with fine weather. From July to September, south-westerly and southerly winds prevail, sometimes S.E., with squalls and rain. In September the monsoon changes, and the weather is unsettled. From October to December, northerly winds prevail, interrupted occasionally by fresh gales from the N.W. or North, with heavy rain.

During the S.W. monsoon, the Kuro Siwo is felt along the West side of these islands, branching to the eastward through the channels at the rate of $1\frac{1}{2}$ knot an hour.

Between the Lu-chu Islands and the Bonin Islands very boisterous weather is frequently met with.

Sandon Rocks were discovered by the ship *Viscount Sandon*, December 8, 1850, on her passage from Singapore to Shanghai. The highest rock is about 30 ft. above the sea, with two low detached rocks to the westward, and a reef between them. At a quarter of a cable from their N.W. side was 12 fathoms water, and at half a mile to the N.W. 15 to 22 fathoms with overfalls over an uneven bottom. No other dangers were visible. Their position is given as lat. $28^{\circ} 44' N.$, long. $129^{\circ} 47\frac{1}{2}' E.$

AMAMI OO SIMA, Oho sima, *Harbour or Bungalow Island*, is the largest of the chain of islands lying between Okinawa sima, or Great Lu-chu, and Japan. It is about 30 miles in length, N.E. and S.W., is high, well cultivated, and, from the number of villages seen along the coast, must contain a large population. There are two peaks on its South end, 1,674 and 1,420 ft. respectively above the sea. This island was partially surveyed by the American squadron in 1856, and by the Japanese in 1873. The outline of its coasts appears much broken, and deeply indented with numerous bights, most of which are very bold. Wood and water are good and plentiful; but refreshments scarce. The inhabitants are timid and harmless.

The North end is high, and being connected with the main part of the island by a narrow, low isthmus, it has the appearance, on some bearings, of being isolated. Foul ground appears to extend about $2\frac{1}{2}$ miles N.E. by E. from the North end, and two rocks to rise from it, the northern of which is 76 ft. high. The North extreme of the island is in lat. $28^{\circ} 31' 40'' N.$, long. $129^{\circ} 42' E.$

There is anchorage in several open bays on the North and West sides of the island, those best known being Fukau Bay, Naze Harbour, and Hancock Bay. Sima-u Bay, on the East coast, also affords anchorage.

Hancock Bay, a landlocked inlet at the West end of Oho sima, is about 6 miles long, and from a half to 1 mile in width, the entrance being southward of *Itateka sima*, an island about 1,000 ft. high. A reef, awash at half tide, extends a quarter of a mile westward from the West point of *Itateka*. The depth usually varies between 27 and 40 fathoms, over mud. This bay was surveyed by Staff-Commander Walker, H.M.S. *Iron Duke*, 1882.

Precipitous hills, of volcanic origin, 500 to 1,400 ft. high, surround the bay. There are several villages on the shores, but the inhabitants are poor, timid, and very dirty. Wood and water are easily obtained; fowls, eggs, goats, and pigs may be obtained in small quantities. Sago, rice, and sugar-cane are the principal products.

Sots-taka saki, the S.W. point of Hancock Bay, had a large red land-slip on its northern side. *Outer Point*, 2½ miles N.E. of *Sots-taka saki*, when seen from the westward, appears as a remarkable conical-shaped peak. It is in lat. 28° 18' N., long. 129° 12' 30" E.

The fairway up the bay to the anchorages near its head is free from danger, but the outlying points should be avoided, as they all appear to have ledges extending from a half to 1 cable from them. It is high water, on full and change, at 7^h 30^m; springs rise 7½ ft.

Naze Harbour, about 19 miles E.N.E. of Hancock Bay, only affords anchorage close to the head of the southern of the two bights; the other bight is full of rocks.

Kageroma or Katona sima, a narrow island of irregular shape, lies parallel to the S.W. shore of Oho sima, forming a strait known as *Oho sima* or *Porpoise Strait*, 10 to 12 miles in length, and from three-quarters to 2 miles wide. At its western entrance is *Vincennes Bay*, a small bay formed at the North end of Katona sima; the entrance of this bay is narrow, and the current strong.

In entering the strait from the eastward, choose a mid-channel course; the North shore has the least number of sunken rocks off it. A bank of 6 to 7 fathoms, coral and hard ground, lies 1½ mile from this entrance, but this bank is not safe to anchor upon. *Ware Rock*, in the middle of the western entrance to the strait, is 116 ft. high; and half a mile S.S.W. from it is a rock awash. *Kuji Mura Bay*, on the North shore, has anchorage for two vessels at single anchor, in 10 and 12 fathoms. The bottom is fair holding-ground, being a mixture of mud, broken coral, and gravel. Probably no anchorage in this strait would be secure during a typhoon. It is high water, on full and change, at 6^h 34^m; springs rise 6½ ft., neaps 4½ ft.

Ioro sima and *Uke sima* are two small islands, from 1½ to 2 miles southward of Katona sima; the former is 1,002 ft. high, and the latter 1,353 ft. In their vicinity are many scattered rocks.

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Kikai-ga sima, lying about 15 miles S.E. of the North end of Oho sima, is moderately high, about 7 miles in length, N.N.E. and S.S.W., and inhabited. The summit, 867 ft. high, is in lat. 28° 18' N., long. 129° 59½' E.

Germantown Reef.—The U.S. ship *Germantown*, March 23rd, 1859, when beating along the S.E. side of Oho sima, struck on a coral reef said to lie in lat. 28° 16' N., long. 129° 58' E. From the shoalest spot found, 6 feet, the highest terrace on Kikai-ga sima bore N.E. ¼ E., 6 or 7 miles. The reef is about a mile long, N.N.E. and S.S.W., and half a mile wide.

Another shoal spot was found lying 2 miles North from the centre of this reef, with apparently a clear passage between. Reefs were also seen from aloft, extending from 1 to 2 miles from the S.W. and S.E. points of Kikai-ga sima.*

Marsh Reef, placed on the charts in lat. 28° 12' N., long. 129° 54' E., was reported by Mr. Marsh, in 1853, as lying 7 miles S.W. of Kikai-ga sima, extending N.N.E. and S.S.W., about 3 miles, with a depth of 12 ft. on it at high water. It is probably one of the shoals found by the *Germantown*.

Hesper Island, placed on the charts in lat. 28° 8½' N., long. 130° 15' E., was reported by Mr. James, H.M.S. *Hesper*, 1864, as lying S.E. by S., 18 or 20 miles from *Tabiyo saki*, but it is doubtful if this latter island exists, at least in the position assigned to it, at about 2 miles north-eastward of Kikai-ga sima.

KAKIROUMA, *Tok sima* of Siebold, or *Crown Island* of Broughton in 1797, is about 15 miles long, North and South, and 9 miles broad. It is hilly, and the highest peak, 2,207 ft., which is near the centre on the East side, is in lat. 27° 45' N., long. 128° 53' E. Its northern peak, 1,860 ft. high, has a village on its N.W. face. Lieut. Carpenter, H.M.S. *Maggie*, 1882, states that the S.E. and South coasts of this island are protected by a fringing reef extending 1 to 3 cables off shore, containing several boat harbours and one junk harbour; the latter 2 miles southward of Cape Ototsino, the East point, near which is a village of some 1,500 huts. The entrances through these reefs are marked by poles. The island is wooded, and well cultivated. North of Black Point, on the western side of the island, is a high black cliff, 400 ft. high.

Tok sima Rocks, two in number, 166 ft. high, lie 2 miles N.E. by N. of the N.E. point of Kakirouma Island.

Iwo sima, or *Sulphur Island*, 34 miles W. ¼ N. of the North end of Kakirouma, is 1½ mile long, N.W. and S.E., and inaccessible. The South peak, in lat. 27° 52½' N., long. 128° 14' E., is 541 ft. high, and is a volcano. The ground is very rugged, with here and there a thin coat of brown grass. The South end is of a deep red colour, with occasional spots of bright green.

Yerabu sima of Siebold, or *Wukido* of Basil Hall, 17 miles S.W. of Kaki-

* In the American chart *Germantown Reef* is placed 2½ miles S. by W. ¼ W. from the S.W. extreme of Kikai sima, or in lat. 28° 14½' N., long. 129° 53' E.; and *Marsh Reef* is placed 1½ mile southward of it.

rouma, is $9\frac{1}{2}$ miles long, N.E. and S.W., and well wooded. Its southern peak, 687 ft. high, is in about lat. $27^{\circ} 22\frac{1}{2}'$ N., long. $128^{\circ} 35'$ E.

Yori sima, or *Julo* of Basil Hall in 1816, 17 miles S.S.W. of Yerabu sima, is 413 ft. high, wooded, and nearly surrounded by a reef which projects farthest off its North and East sides. Its summit is in lat. $27^{\circ} 2'$ N., long. $128^{\circ} 26\frac{1}{2}'$ E.

OKINAWA SIMA, or *Great Lu-chu Island*, is about 56 miles long, N.E. and S.W., preserves a tolerably uniform breadth of about 10 or 12 miles, and is well inhabited, the population amounting to about 1,000,000 in 1882. The North end is high and bold, with wood on the top of the hills. The N.E. coast is also abrupt, but quite barren, and the N.W. side rugged and bare. The S.E. side is low, with very little appearance of cultivation. The South, S.W., and western coasts, particularly the two former, are of moderate height, and present a scene of great fertility and high cultivation, and here the mass of the population reside. The inhabitants are both friendly and hospitable; the Japanese Governor resides at Napha-kiang. Sugar, rice, fowls, sweet potatoes, cucumbers, and eggs, can be procured.

There are two good harbours, viz., Napha-kiang, and Port Oonting or Melville, on the West and N.W. side. Deep Bay, on the same side, and Barrow Bay, on the East coast, are not recommended.

NAPHA-KIANG, on the S.W. side of Okinawa, is the principal seaport of the island, and perhaps the only one possessing the privileges of a port of entry. The outer harbour, or Napha-kiang Road, is protected to the eastward and southward by the mainland, whilst in other directions it is surrounded by a chain of coral reefs, which answer as a tolerable breakwater against a swell from the northward or westward, but afford, of course, no shelter from the wind. The holding-ground is so good, however, that a well-found vessel could here ride out almost any gale in safety. The inner, or Junk Harbour, carries a depth of 2 to 3 fathoms, and, though small, is sufficiently large to accommodate with ease the fifteen or twenty moderate-sized junks which are usually found moored in it. The town stands on the South shore of an island, facing the inner harbour.

The small coral islands lying 4 miles W.N.W. of the entrance to Napha-kiang are called *Tzee* (Kei of Siebold), and Reef Islands by Capt. Basil Hall. They are four in number, low, sandy, slightly covered with vegetation, and surrounded by coral reefs.

Sakihana saki, or *Abbey Point*, the South extremity of the road, in lat. $26^{\circ} 12' 22''$ N., long. $127^{\circ} 40' 50''$ E., may be known by its rugged outline, and by a small wooded eminence, called *Wood Hill*, about $1\frac{1}{4}$ mile S.S.W. of it. The mainland here falls back and forms a bay, which is sheltered by coral reefs northward of Abbey Point; they are, however, disconnected, and between them and the point is Oar Channel, sufficiently deep for the largest ship. A reef extends from Abbey Point to the S.W., and also to the eastward.

There are three passages leading into Napha-kiang Road, viz., the South,

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Asashe, or *Blossom Reef*, about 7 cables N.W. by W. from Abbey Point, is composed of coral, about 3½ cables long, E.N.E. and W.S.W., with a good passage on each side. The *South Channel*, or *Miyako guchi*, between it and Abbey Point, should be adopted with southerly winds and flood tides, and the *Oar Channel*, between Blossom and Oar Reefs, with the reverse. Off the entrance of South Channel, Lieut. S. Bent, of the U.S. Japan Expedition, 1853, found two patches of only 2½ and 1½ fathoms water; the former named *Lexington Reef*, lying W. ½ S., 1¼ mile from Abbey Point; and the latter, *Sotokana no she*, of 1½ fathom, W.S.W., 1¼ mile from the point.

Shen no she, or *Oar Reef*, about 4 cables in extent, lies 6½ cables N.E. ¾ E. from Asashe. Other reefs extend a mile northward of it. *Oar Channel*, or *Karafune guchi*, between Asashe and Shen no she, has depths of 16 to 24 fathoms in it; but within the entrance is *S.W. Rock*, having 2 fathoms on it, 6½ cables N. by E. ¾ E., easterly, from Abbey Point. Care must also be taken to clear *Ingersoll Patches*, on which there is only 1 fathom water; they lie 8½ cables W. ¼ N. from Capstan Head, and 7½ cables N.E. ¾ E. from Abbey Point.

North Channel, or *Yamato guchi*, between Jisha Kashe and Inabushe Reefs, is about one-quarter of a mile wide, with depths of 11 to 12 fathoms, but its southern part is contracted by detached shoals.

When off Abbey Point, *Kumi* or *Tumai Head*, a rocky headland, will be seen about 1¼ mile northward of the town; and upon the ridge of high land beyond it are three hummocks to the left of a cluster of trees. In the distance, a little to the left of these, is *Mount Onnodake*, in lat. 26° 27' N. *Ukiga saki*, a remarkable rock, which from its form has been named *Capstan Head*, will next appear; and then to the northward of the town a rocky head, with a house upon its summit, called *False Capstan Head*. At the back of Capstan Head, 2½ miles inland, is *Sheudi Hill*, upon which the upper town, *Shurijo*, the capital of Lu-chu, is built.

An abundance of water can always be obtained at the fountains in Junk River, where there is excellent landing for boats. There is a good spring near the tombs at Kumi Bluff; but unless at high tide, and with the water quite smooth, the landing-place is impracticable. The town of *Napha* is situated on the North side of the entrance of *Junk River*, at the southern part of the road. This river will only admit small vessels, the channel passing between two piers, each having a fort on its extremity.

The outer anchorage is in 14 fathoms, muddy bottom, with Abbey Bluff bearing S.W. ¾ S., and Capstan Head E. by S. ¼ S.; but this anchorage would be dangerous with strong westerly gales. The best anchorage is in *Barnpool*, or *Tomari ura*, at the N.E. part of the road, in 7 fathoms, where a vessel may ride with great security. The entrance to Barnpool is between Barn Head Reef and the reef off Capstan Head.

It is high water, on full and change, at 6^h 32^m; springs rise 7 ft. The flood sets to the northward, over Blossom Reef, and the ebb to the southward.

Directions.—As may be readily understood, it is difficult to give intelligible directions for this complicated harbour without the chart.

To sail by the South Channel, between Blossom and Abbey Reefs, having well opened Capstan Head, haul towards Abbey Reef, and bring the right-hand hummock about half a point eastward of Kumi Head; this mark will lead through the South Channel, in about 7 fathoms, over the tail of Blossom Reef. A vessel may now round Abbey Reef tolerably close, and steer for the anchorage in 7 fathoms, about half a mile N.N.W. of False Capstan Head, taking care to avoid the *Ingersoll Patches*. Should the wind veer to the eastward in the South Channel, with the above mark on, do not stand to the northward, unless the outer cluster of trees near the extremity of Wood Hill is in line with, or open westward of Table Hill, a square rocky island to the southward of it. This mark clears also the tongue of Oar Reef.

The following directions for the South Channel are by Lieut. S. Bent, of the U.S. Japan Expedition, 1853.

The clearest approach to Napha-kiang Road from the westward is by passing northward of the Kerama Islands and sighting Agunyah Island, which will be recognised by its wedge-shaped appearance; from thence steer a S.E. course for the road, passing on either side of Reef Islands, not approaching them, however, too near on the western and southern sides, as the reefs below water in these directions are said to be more extensive than shown on the chart.

After clearing the Reef Islands, steer for Wood Hill on a S.S.E. bearing until the notch in the distant hill bears E. by N. $\frac{1}{4}$ N., the mark for the South Channel. This will lead well clear of Blossom Reef, when the white tomb and clump of trees or bushes southward of Kumi Head can be easily distinguished. An E. by N. $\frac{1}{4}$ N. course now until Abbey Point is in line with the outer trees will clear S.W. Rock, when haul up for Kumi Head, and select a berth about half a mile northward and westward of False Capstan Head. This channel, being quite straight, is better for a stranger entering the harbour than Oar Channel, which, though wider, has the disadvantage of its being necessary for a vessel to alter her course some four or five points, just when she is in the midst of reefs which are nearly all covered.

If the wind be to the north-eastward, it will be advisable to beat through the *Oar Channel*, in preference to the South Channel. To do this, bring False Capstan Head in line with a flat cluster of trees on the ridge to the right of the first gap South of Sheudi, which will clear the North tongue of Blossom Reef; but unless Table Hill be open eastward of Wood Hill, do not stand to the southward, but tack directly the water shoals to less than 12 fathoms, and endeavour to enter with the marks on. Having passed Blossom Reef, which will be known by Wood Hill being seen to the right of Table Hill, stand towards Abbey Point as close as convenient, or on nearing Oar Reef take care

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of a tongue extending to the eastward of it, and of S.W. Rock, and be careful to tack immediately the outer trees of Wood Point open with Abbey Point. In entering South or Oar Channels, remember that the flood sets northward, over Blossom Reef, and the ebb southward.

A good mark to run through Oar Channel is to bring the centre of the island in Junk Harbour (known by the deep verdure of its vegetation) to fill the gap between the forts at the entrance of that harbour, and steer a S.E. $\frac{1}{2}$ E. course, until Capstan Head bears East, when haul up E. by N. $\frac{1}{2}$ N., and anchor as before directed.

The North Channel is much contracted by *Victorieuse Rocks*, a range of detached rocks lying off the reef on the West side, and should not, under ordinary circumstances, be attempted by a stranger, as at high water the reefs are almost entirely covered. To enter by this channel, bring a remarkable notch in the southern range of hills in line with a small hillock just eastward of False Capstan Head, S. by E. $\frac{1}{2}$ E.

From Napha-kiang the coast trends in a N.E. and then N.W. direction, forming a deep bight, of which little is known. *Gama Satchi*, or *Cape Broughton*, off which there is a reef, is the northern extreme of this bight. From Gama Satchi the coast takes an E.N.E. direction for 58 miles, and then W.N.W. for 26 miles to Suco Island, between which and Gama Satchi there is a deep indentation named Deep Bay.

Deep Bay (at the head of which is the observatory spot of the U.S. ship *Vandalia*, 1854, in lat. $26^{\circ} 35' 35''$ N., long. $127^{\circ} 59' 42''$ E.,) is formed on the western side of Great Lu-chu, and, although open to the West and S.W., affords good anchorage off the town of *Naguh*, about half a mile from its head; for winds from these quarters rarely blow home, and if they do they never raise a sea, as the latter is broken by the great depth of the bay. The country around the head of the bay is fertile and populous.

Suco, or *Setei Island*, lying about a quarter of a mile from the N.W. coast of Great Lu-chu, to the northward of Deep Bay, has excellent anchorage between its eastern side and the coast, protected from all winds; and here wood, water, and fresh provisions can be easily procured. A reef extends nearly half a mile S.S.E. from its South end.

Tubootch Harbour, a little to the North of Suco Island, is 2 miles long, and three-quarters of a mile wide, partially protected from the westward by a line of breaking reefs, with some narrow but tolerably deep channels through them. The North side of this bay is full of banks, but towards the centre there are safe spots with from $3\frac{1}{2}$ to 11 fathoms water, mud bottom. The best channel is that to the South, which is about 2 cables wide, with a depth of 7 fathoms.

Cape Niofa, the N.W. point of Great Lu-chu, is $2\frac{1}{2}$ miles to the North of Tubootch, between which and the latter are the small islands named Mina and Gibson, with a deep channel between them and the shore. *Iyo Island* lies 2

North Pacific.

miles to the westward of Cape Niofa, the channel between being encumbered with shoals. Iye is $4\frac{1}{2}$ miles in length, East and West, and about $1\frac{1}{2}$ mile broad, with a sugar-loaf peak, 575 ft. high, at its eastern end; otherwise it is low and flat. From Cape Niofa the coast takes an easterly direction for $8\frac{1}{2}$ miles to Kui Island, at the North side of the entrance to Port Oonting.

Port Oonting, or *Mehville*, is on the N.W. part of Great Lu-chu, and its entrance is between the western side of *Kui* or *Herbert Island* and the eastern side of the reef fronting the peninsula, which latter projects 5 or 6 miles to the westward, having a small islet near its extremity. Iye sima, or Sugar-loaf Island, lying about 12 miles westward of the entrance, is a good guide for it. At a little more than a mile southward of Kui, and nearly connected with it by reefs, is *Yaga-ji* or *Lyra Island*. Anchorage is obtained in the narrow strait, nowhere much more than 2 cables wide, between it and the land. Good water can be obtained at the village of Oonting, which is on the North side of the strait. It is high water, on full and change, at 6^h 35^m; springs rise about 8 ft.

It is advisable to heave-to, or anchor in 20 or 25 fathoms, off the entrance until boats or buoys can be placed along the edges of the reefs bordering the channel. In entering, steer for the western shore of Kui Island until Hele Rock is in line with Double-topped Mountain (a distant double-topped hill, the second highest of the range), bearing S.E. $\frac{1}{2}$ S. Steer in on this mark, until Chimney Rock bears S. $\frac{1}{2}$ E.; then for Chimney Rock until Rankin Point bears S.W. $\frac{1}{2}$ W.; then for that point until the port is entered, when anchor, giving the vessel room to swing clear of the reef extending northward of Rankin Point, and she will be as snug as if lying in dock, with good holding-ground, completely landlocked, and sheltered almost entirely from every wind.

Shah Bay, about 8 miles E.S.E. of Port Oonting, is a beautiful landlocked sheet of water, but the reef fronting the entrance prevents its being accessible to vessels of larger size than the junks which frequent it; within the entrance the water deepens to 12 and 8 fathoms, the bottom being soft mud. On the southern shore of the bay was found iron ore, mineral coal, and sulphur. The coal appeared to be of poor quality and mixed with earth, but good coal might perhaps be found by digging.

The coast from Shah Bay trends to the N.N.E. for 47 miles, and appears to be void of anchorage; it has not been minutely examined, but it is probable that it is very foul. *Cape Hele*, the northern extremity of the island, is hilly, and from thence round the eastern shore, as far as Barrow Bay, there appears to be no anchorage. *Sidmouth Islet*, surrounded by reefs, lies off the N.E. side of the island.

Barrow Bay is a deep inlet, bounded by shoals, near the middle of the eastern coast of Great Lu-chu. The following description is by Lieutenant G. B. Balch, of the U.S. ship *Plymouth*, 1854:—

"A reef, of coral formation, and bold to approach, commences 5 miles from the South point of Great Lu-chu, and extends in an unbroken chain, outside

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tion of a narrow channel between the inlet off the N.E. end of Kyoko or
Kudaka Island, and the island of Taking. Ichey Island forms the south-
eastern point of Barrow Bay, which is useless for all purposes of navigation,
being exposed to the East winds and ocean swell. There is, however, secure
anchorage in about 15 fathoms water on the western sides of Ichey, and of
Hanadi, the next islet to the southward; this anchorage is the only place of
shelter on the eastern coast of Great Lu-chu."

Capt. von Oesterreicher, Dutch corvette *Erzherzog Friedrich*, 1874, reported
apparently shoal water as lying 12 miles eastward of the entrance of Barrow
Bay, in lat. 26° 28' 50" N., long. 128° 22' 21" E.

Mathews Bay, near the S.E. end of the island, is filled with coral reefs.
Cape Yakimu, the South end of Great Lu-chu, is hilly; it would be advisable
not to approach it within 2 or 3 miles, as it has not been closely examined.

Heber Reef was reported as a rock about 5 ft. above water, surrounded by
reefs, lying 6 or 8 miles W.S.W. from Cape Yakimu. Its existence is doubtful,
as its description agrees in every particular with Halls Breakers. Captain
Zirzow, German war-vessel *Vineta*, searched for it without success in 1881.
Halls Breakers is a large, circular, rocky patch, a part of which is above water;
it lies 7 miles W. by N. ¼ N. from Cape Yakimu.

KERAMA ISLANDS.—To the westward of the South end of Okinawa sima
are the Kerama Islands, the Amakirima of Basil Hall in 1816, and Kera sima
of Siebold. The group consists of the Maikirima Islands, Koru sima, Toka
shika sima, Aka sima, Yakang Island, Zamami sima, and Kupa sima, with
many islets and rocks in their vicinity, the whole extending 9 miles, North
and South, and 12 miles East and West. Capt. Mathison, H.M.S. *Mariner*,
1849, states that all the spaces between them appeared filled with reefs and
breakers.

Maikirima Islands, the easternmost of the group, consist of one island 540
feet in height, and two other islets to the northward: Cone Islet, the northern,
in lat. 26° 14' N., long. 127° 28½' E., has a conspicuous detached rock off its
S.W. end, and must not be approached within a mile, as reefs surround it.
Koru sima, or *Saddle Island*, 3¼ miles N.W. of Maikirima, and the northern-
most of the group, is 459 ft. high; off its N.W. end are a few small islets and
rocks, and a reef extends half a mile from its South and S.W. ends. *Shag
Rock* lies midway between Koru sima and the South rock of the Maikirima
Islands.

Zamami sima, on the North side of the group, is 3 miles long, E.N.E. and
W.S.W., and is very rugged and irregular of outline, rising to a height of 540
feet. In the centre are two deep bights, one on each side. *Whale Head*, a
small islet, nearly half a mile off the N.E. side, should not be approached
within 1½ cable. *Aka sima*, consisting of three islands, with several islets and
rocks, lies to the southward of Zamami; the northern and largest island is 641

feet high. *Mole* and *Whale Reefs* appear above water; the former lies S.W., $1\frac{1}{2}$ mile, and the latter S. $\frac{1}{2}$ W., $2\frac{1}{2}$ miles, from the South point of the southern Aka Island.

Yakang Island, the N.W. island, is about a mile in diameter, with a peak 756 ft. in height; it is bordered by a reef which stretches farthest off its North end, having a rock at its North extreme. *Kupa sima*, $1\frac{1}{2}$ mile South of Yakang, is 916 ft. high, and has reefs projecting from its N.W. side, and from the South point.

Tokaabiki, the centre island of the group, 553 ft. in height, is the largest, being nearly 5 miles in length, North and South, and more than a mile in width. An islet with a reef extends $1\frac{1}{2}$ mile from its N.E. point, and Chimney Rock, 315 ft. high, with a similar reef, projects from the southern point.

Kerama Channel.—Anchorage may be had in *Aoga ura*, on the South side of Zamami sima, opposite the bight in that island. In approaching from the northward, take care to avoid the patch lying off the eastern point of Zamami, and nearly in mid-channel. Several other patches exist, of which there is no description. Great caution should, therefore, be used when navigating in this locality. It is high water, on full and change, at 6^h 43^m; springs rise $5\frac{1}{2}$ ft., neaps 4 ft.

Tunashee, $9\frac{1}{2}$ miles N.W. by N. $\frac{1}{2}$ N. from Yakang, is about 2 miles in length, and has two peaks, the northern 492 ft. high, and the southern 603 ft. A reef extends to a considerable distance from its North and N.W. sides. *Aghesinak*, or Flat Island, lying about $2\frac{1}{2}$ miles westward of the North peak, is merely a rock surrounded by a reef.

KOMISANG, about 20 miles West of Tunashee, is very irregular in shape, about 6 miles long, and the same in width; its northern peak is 1,108 ft. in height, and the southern 1,028 ft. The western side of the island is fringed with reefs, and a very dangerous reef extends 6 miles off the East side, on which the ship *Elizabeth and Henry* was lost. About a mile off the South end of Komisang is a high rock.

Tu sima, in lat. 26° 35' N., long. 126° 51' E., lies N. by E. $\frac{1}{2}$ E., $13\frac{1}{2}$ miles from the North peak of Komisang. It is a rocky islet, about 60 ft. high, one quarter of a mile in extent, with a reef surrounding it.

Agunyah, a wedge-shaped island, about 3 miles long, N.E. and S.W., and 300 ft. high, lies N.N.E., 13 miles from Tunashee.

The **MONTGOMERY GROUP**, consisting of two large islands, with several islets and shoals near them, lies 15 to 16 miles N.W. of Cape Heto, the North point of Great Lu-chu. *Yehya sima*, the largest and northern island, 963 ft. high, is 7 miles long, N.E. by N. and S.W. by W.; off its southern end a reef extends $2\frac{1}{2}$ miles to the S.W., having an islet about a mile from the shore, and a rock, awash, at its extreme. *Isena sima*, the southern island, is about 400 feet high, with a small detached rock about 1 mile East of it. *Yanagi Islet*, southward of Isena sima, is about 50 ft. high, with a reef off its N.W. side.

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MEIACO-SIMA ISLANDS.

This group, belonging to Japan, forms the westernmost portion of a chain of islands extending in an easterly and north-easterly direction from Formosa to the southern extremity of Japan, and is divided into two divisions, Pa-chung-san and Tai-pin-san. Besides these there is *Chung-chi Island*, a high, uninhabited mass of rocks, with dangerous patches extending between it and the S.W. point of Ku-kien-san, about 8 miles to the N.E.; and to the W.N.W. of Chung-chi is Kumi Island, conspicuous by the peculiar sharpness of its lofty peak, 700 ft. high, and table base. The whole group is clothed with vegetation, and horses and cattle are abundant. The following description is chiefly derived from the voyage of H.M.S. *Samarang*, Capt. Sir E. Belcher.

These islands lie in the monsoon region of the China Sea, the S.W. monsoon blowing from April to September, and the N.E. monsoon from October to March. Typhoons are experienced from July to October, inclusive, and sometimes in November.

KUMI ISLAND is composed of coralline limestone, and all its ranges are capped with trees and brushwood, but, excepting the pine fir, which contains a great portion of resin, none attain any size. There are four villages on the island, one on the West, and two on the North side, one of which is inland, in a basin-shaped valley. The principal town and port is on the North side, but the entrance is so narrow and shallow that vessels can only enter or leave at spring tides and with very smooth water. Temporary anchorage, in fine weather, may be found on a sandy ledge northward of the town.

A *dangerous shoal*, 3 miles in extent, E. by N. and W. by S., was reported, in 1843, as lying N.W. by W., about 10 miles from Kumi. *Breakers* have also been seen, apparently on a dangerous shoal, extending E. by S. and W. by N., and bearing from Kumi S.W. by W., about 10 miles distant. No indications of these shoals were seen from the ship *Veloz*, in 1860, or from the steamer *Benledi*, in 1879.

Boudronet Rocks, in lat. 24° 10' N., long. 122° 33' E., were reported by M. Boudrouet, of the French vessel *Roebur*, 1864, as being a group of rocks 65 ft. high, perpendicular on all sides, and the whole about 100 yards in length. They were not seen by Capt. Ross, SS. *Benledi*, 1879.

The PA-CHUNG-SAN GROUP, or western division, consists of ten islands, of which five only are at all mountainous; the remainder are flat, like the coral islands in the Pacific, and similarly belted with reefs, which connect them into a distinct group. Ku-kien-san and Pa-chung-san, the principal islands, afford several commodious harbours, and are, with good charts, quite safe of approach. Port Haddington, on the West side of the latter island, would shelter a large fleet, but it abounds with coral patches, rising suddenly from 10 or 15 fathoms almost to the surface; in clear weather all those having as little as 5 fathoms

are clearly discernible, and therefore easily avoided. Except on the northern side of Ku-kien-san and the latter port, watering would be found very difficult, as reefs extend a great distance from the mouths of the streams. *Seymour Bay*, at the S.W. angle of Ku-kien-san, must however be excepted, for there a fine stream enters the sea in deep water, and a vessel might be moored sufficiently close to lead the hoses from the pumps into her, without the intervention of boats and casks.

KU-KIEN-SAN ISLAND, or *Nishiomote sima*, is $1\frac{1}{2}$ miles long, and 12 miles broad, and its highest peak is about 2,000 ft. above the sea. With respect to the various harbours of Ku-kien-san, there are two or three adapted for shelter for small vessels, or even those drawing 18 ft., where a refit might be accomplished in still water in any monsoon, or where steam-vessels might lie safely for the purpose of obtaining wood; and there are two other open bays, well sheltered in the N.E. monsoon, admirably adapted for watering; but there is no other inducement to visit this island. All the dangers are well marked by the coral fringe which extends about a cable from the outline. *Hatoma sima*, a small island $2\frac{1}{2}$ miles north-eastward of the North point, is about 40 ft. high, and encircled by a reef.

Hasyokan, *Namiteruma sima*, or *Sandy Island*, about 14 miles S.E. of Chung-chi, is 3 miles long, East and West, and has a few trees and huts on it. Reefs appear to extend about a mile all round it, and there is said to be no safe channel between it and Chung-chi. *Koubah*, *Roberton*, *Baugh*, *Inglefield*, and *Loney Islands* are on the reef connecting Ku-kien-san with Pa-chung-san, the latter island being also connected, by numerous reefs, with Hasyokan.

PA-CHUNG-SAN ISLAND, or *Ishigaki sima*, is very irregular in outline, terminating to the N.E. in a long, narrow peninsula, the extreme North point of which is *Adams Point*, or *Hirakubo saki*, in lat. $24^{\circ} 38' N.$, long. $124^{\circ} 20' E.$ The island is fringed by a coral reef, and is connected to the above-mentioned islands by a plateau of coral. Its highest part, near the centre of the peninsula, is 1,700 ft., and there are two other peaks of 1,500 and 1,200 ft. respectively, the last-mentioned being near *Adams Point*.

Broughton Bay, or *Miyoshi minato*, a snug little anchorage on the S.E. side of Pa-chung-san (safe only, however, during the N.E. monsoon) is open to the southward, and affords only space for small vessels between the reefs extending from the shore. In approaching from the westward, as Chung-chi is neared, Hasyokan will soon be seen, and, avoiding the space northerly of a line between it and Chung-chi, a vessel may safely stand on, passing within 1 mile of the southern limit of Hasyokan, and work for the S.W. angle of Pa-chung-san, avoiding the reefs which extend from it in a direct line S.W. to Hasyokan. A high rock, named *South Rock*, will point out the outer reefs of Pa-chung-san. The dangers between it and Pa-chung-san must be avoided by the eye, the shoals being visible in 5 or 6 fathoms, and the sea breaking upon those of 2 and 3 fathoms. The opening in the reef is in the heart of a deep indentation,

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just northward of the low S.W. point of the island, and it has apparently a centre bar. The right-hand opening is the proper one.

From the eastward the dangers are clearly visible. After making the land, edge along the southern and eastern breakers until the abrupt turn of the breaker line is seen, at which moment the extreme S.W. point of the bay will open. The breakers have regular soundings off them, but the course in will probably lead in 7, 8, or 9 fathoms, deepening to 14 or 15 fathoms off the inlet. As the breeze generally blows out, it will be advisable to send a boat to find clear ground off the opening, and shoot up and anchor; the vessel may then be warped in. But if merely intending a cursory visit, the outer anchorage appears good.

At Broughton Bay, neither wood nor water can conveniently be procured; and the only reason for noticing it is, that a port of refuge with still water, in case of disaster, may be found on this side of the island, if a disabled vessel could not beat round to the more secure harbour of Port Haddington.

There is a passage from Port Haddington into Broughton Bay, which was used by H.M. ships *Lily* and *Contest*, in 1852, but it abounds with coral reefs. —Commander J. W. Spencer, H.M. Sloop *Contest*.

PORT HADDINGTON.—No safe anchorage is to be met with between Broughton Bay and Port Haddington, which is on the West side of Pa-chung-san; although during the S.W. monsoon there are several good bays on the northern side of the island, where anchorage might be found, but certainly not adapted for refit.

When rounding the north-eastern extremity of Pa-chung-san, the two low coral islets of *Mitsuna* and *Turara* ought to be avoided at night, but the dangers by day are clearly denoted by breakers. To the northward of these islets the ground is foul, and the *Samarang* was compelled to tack to the westward in 7 fathoms, at least 10 miles North of them. They are surrounded by reefs, and Sir Edward Belcher strongly suspected that extensive banks or ledges of coral connect these islands with Tai-pin-san; and a good reason for this offers in the fact of their being included by the natives in the Tai-pin-san group.

Proceeding from Broughton Bay to Port Haddington, after rounding the N.E. end of the Pa-chung-san breakers, and running to the westward the length of the island, haul close round the N.W. angle, and edge along southerly within about a mile of the breakers. The port will then open out, into which, with the prevailing breeze of the N.E. monsoon, it will be necessary to beat. Off Hamilton Point, the North point of the port, which is in about lat. 24° 25' N., long. 124° 6½' E., will be seen a remarkable little rocky hummock, upon which was left a large pile of stones. The bottom, for more than a mile off the point, is rocky and dangerous; but as all the dangers off this port are visible from aloft, there is no risk with a proper look-out. The inner parts of the port have numerous shoals, but there is still sufficient good anchorage, where a vessel will be landlocked. Two rocks were reported by Lieut. Luard, R.N., but he gave no marks for determining their position. The *Samarang*

anchored about a mile or less within Hamilton Point, in 10 fathoms, clear bottom. It is high water, on full and change, at 6^h 45^m; springs rise 7 ft.

This is a most convenient port during the N.E. monsoon. It is landlocked, it is true, but there is a long fetch for the sea with a S.W. gale, and in that season typhoons are said to be very violent about this region.

In approaching Port Haddington from the westward, round the reef which extends 1 mile off Hamilton Point, and shoot into 15 fathoms. The chart exhibits several awkward patches, but a vessel can thread her way between them, if the sun be bright, as all the shoals may easily be traced from aloft.

A convenient watering-place was established by sinking a cask and suspending the suction-hose of the pump over it, to prevent the sand from being sucked in. Wood is abundant, and the position is further preferable by being so far from the villages as to prevent the authorities from feeling alarmed.

Ishigaki Harbour is a safe and commodious anchorage on the southern shore of Pa-chung-san, between it and the reefs which connect the island with Robertson Island. It is open to the N.W., and probably is, therefore, not so sheltered as Port Haddington.

TAI-PIN-SAN GROUP.—The islands composing the Tai-pin-san (or Ty-ping-san) or eastern division, are Tai-pin-san, Yer-ra-bu, Ku-ri-mah, Coruma, and Hummock Island, all connected by extensive coral reefs. The two islets Mitsuna and Tarara, between Tai-pin-san and Pa-chung-san, are said to be a continuation of the reefs which extend to the N.E., North, and N.W. of Tai-pin-san, and on which H.M.S. *Providence* was lost in 1797.*

Tai-pin-san Island is surrounded by an extensive chain of coral reefs, upon which the islands of *Ku-ri-mah*, *Yer-ra-bu*, *Coruma*, and *Hummock* respectively are situated to the West, N.W., North, and N.E. The reefs do not project far westward from *Ku-ri-mah*, unless in patches unconnected with the main belt. Off *Yer-ra-bu* they extend 3 or 4 miles, but close towards its north-western angle a deep-water channel admits vessels within the belt up to *Hummock* Island and into the main harbour of *Tai-pin-san*. The reefs again spit out at the S.W. angle of *Coruma*, and sweep northerly, as far as the eye can reach (from 100 ft. elevation), round to East in continuous lines of breakers, edging in towards the S.E. extremity of *Hummock* Island, and it was on this reef that H.M.S. *Providence* was wrecked in 1797. A high patch of rocks lies on the N.E. angle of this outer belt, probably 10 miles from the northern point of *Tai-pin-san*.

Safe anchorage during the S.W. monsoon may be found inside the reefs of

* YKIMAH ISLAND, with an islet to the N.E. of it, and placed on the chart 17 miles southward of *Tai-pin-san*, is not otherwise known. It was searched for in vain by Sir E. Belcher in 1844, and was not seen by the U.S. Expedition, 1856. However, Captain von Reiche, of the German ship *Cyclop*, reports that the natives say this island, which they name Oumi Aka sima, does exist, and that it is a group of islands, the largest of which is about 300 feet high.

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Hummock Island, and also safe in the other monsoon; but for a sailing vessel the passage in or out at the latter season would be attended with risk, in case of sudden squalls or gales, and numerous patches beset the whole eastern side of Tai-pin-san. The southern coast-line, from the S.E. breaker patch to the S.W. anchorage, does not offer many dangers if a tolerable look-out be observed. The reefs do not extend more than half a cable from the shore.

There can be no inducements for any vessel to visit Tai-pin-san; neither wood, water, nor any other necessities could be procured.

Capt. Hensheim, of the German ship *R. J. Robertson*, wrecked in July, 1873, near Typinsan, reports that the reef, which on the Admiralty chart is shown as almost surrounding Typinsan, extends from the southern point 7 miles, instead of from a half to 1 mile as there laid down. Providence Reef, to the northward of the island, is said to be of less extent than shown on the chart. The channel West of Corumah (the true name of which was stated to be Ykima) is, according to the natives, clear of danger. The island near the S.W. point of Typinsan, which on the chart is named Ashumah, is called by the natives *Fimah*.

The only harbour of Typinsan is in lat. $24^{\circ} 49' N.$, and is difficult of approach for large vessels, as the reef extends without a break from *Fimah* to Erabou Island. The entrance used by junks is North of the latter island, and is clear for vessels coming from the N.W. as far as the parallel of Erabou. Larger vessels must anchor there behind the reef. The harbour lies about 4 miles S.E. of Erabou, and is readily recognised by the Council House, covered with red tiles.—*Mercantile Marine Magazine*, May, 1874, p. 135.

Directions.—Capt. (Sir Edward) Belcher, H.M.S. *Samarang*, December, 1844, says:—Great caution is requisite in approaching the Meiacosima group from the N.E., East, or South, particularly with fresh breezes, and in the absence of the sun, by the aid of which reefs below water can be detected. They are, from their greenish hue, being covered by seaweed, less distinct than at other places, and, therefore, where they are not marked on the chart, it must not be presumed that the space is free from danger; the lead will not afford timely warning.

Approaching the group from the S.W., the island of Ku-kien-san from its great height will be first distinguished, presenting a round-backed summit closely clad with trees; knolls occur, elevated 2,000 ft. above the sea, but as they seldom present the same appearance, owing to those nearer the coast eclipsing them, their accurate measurement could not be obtained; Adam Peak, which may be noticed on the south eastern outline, was determined to be 1,200 ft. As the island is neared, the high rocky basaltic island of Chung-chi will show out when the western limit of Ku-kien-san bears N.E. by N., and working for this islet no danger can be feared, and should night befall, all the space on the N.W. of Ku-kien-san up to the island of Kumi is safe.

North Pacific.

The *Samarang* entered the group from the westward, passing within 2 miles of the southern reefs or breakers off Hasyokan or Sandy Island, and stood on close-hauled to the eastward, intending to make Ykima, and beat up from it to Tai-pin-san. On the morning following, not seeing Ykima (which is supposed not to exist), and the weather very boisterous, she stood on to the westward to get under the lee of Pa-chung-san, and endeavour to reach some place of shelter. On nearing the latter island she ran down the eastern and southern sides, to the south-western extremity of its reef.

Here was a barrier of breakers as far as the eye could reach from the mast-head, and apparently connecting Hasyokan Island with the group of larger islands. An opening, however, was found into the reef, and after due examination the vessel was shot up into 13 fathoms, into Broughton Bay, and warped into a snug position, where she was moored with just sufficient room to swing, the depths up to the coral ledges varying from 13 to 7 fathoms. Upon nearing the S.W. part of Tai-pin-san, tacked twice, rather close to two off-lying patches, and obtaining soundings with 15 fathoms, a boat was sent ahead. Upon a given signal, for "danger discovered," the anchor was let go, and the vessel found to be in a secure berth, in 12 fathoms, the boat being on the reefs. It is merely an indentation formed by the reefs connecting the western island with Tai-pin-san, and is very unsafe, a heavy sea tumbling in with a southerly wind. The Observatory at the S.W. angle of Tai-pin-san (at the most convenient landing place within the reefs and the last rocky point towards the long sandy bay) is in lat. $24^{\circ} 43' 35''$ N., long. $125^{\circ} 17' 49''$ E. Tai-pin-san should not be approached at all on its northern side, and reefs are said to extend 7 miles southward of the South point of the island.

To the northward of the Meiaco suma group, and north-eastward of Formosa, are several islets and rocks, apparently volcanic, which have been only properly known of late years, and even to the present time their correct number and positions are not absolutely determined. The principal are those to the westward, Hoa-pin-su and Pinnacle, and the Ti-a-usu Islands, these being about 15 miles apart, in a N.E. and S.W. direction. Within this space are several reefs, and although a safe channel exists between Hoa-pin-su and the Pinnacle Islands, which are 2 miles apart, it ought not (on account of the strength of the tides destroying the steerage) to be attempted by sailing vessels if it can be avoided.

HOA-PIN-SU is the south westernmost, and is about 95 miles to the E.N.E. of Kelung Harbour, at the North end of Formosa. The extreme height of Hoa-pin-su is 1,181 ft., the island apparently being cut away vertically at this elevation, on the southern side, in a W.N.W. direction; the remaining portion slopes to the eastward, where the inclination furnished copious rills of excellent water. The North face of the island is in lat. $25^{\circ} 47' 7''$ N., long. $123^{\circ} 30\frac{1}{2}''$ E. There are no traces of inhabitants, indeed the soil is insufficient for the maintenance of half a dozen persons.

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The Pinnacle Group, which is connected by a reef and bank of soundings with Hoa-pin-su, allowing a channel of about 12 fathoms water between it and the *Channel Rock*, presents the appearance of an upheaved and subsequently ruptured mass of compact gray columnar basalt, rising suddenly into needle-shaped pinnacles, which are apparently ready for disintegration by the first disturbing cause, either gales of wind or earthquake. On the summits of some of the flat rocks long grass was found, but no shrubs or trees. The rocks were everywhere whitened by the dung of marine birds. According to the chart, the reef on which these rocks are situated extends 6 miles eastward and 4 miles northward of Hoa-pin-su.

Ti-a-usu, bearing N.E., 15 miles from Hoa-pin-su, appears to be composed of huge boulders of a greenish porphyritic stone. The capping of this island, from about 60 ft. to its summit, which is about 600 ft. above the sea level, is covered with a loose brushwood, but no trees of any size. Its centre is in lat. 25° 58' N., long. 123° 40' E.

RALEIGH ROCK.—The existence of this rock was considered doubtful before July, 1837, when it was seen by H.M.S. *Raleigh*, bearing S. $\frac{1}{2}$ W., distant 12 or 14 miles. Its position by her reckoning was about lat. 25° 57' N., long. 124° 2' E., but later authorities placed it 9' farther eastward. It rises abruptly from a reef to a height of 90 ft. above the sea, is perpendicular on all sides, covers an area of probably 60 ft. in diameter, and appears in the distance as a junk under sail. It was also seen by Sir Edward Belcher in 1845.

According to Commander Bullock, who examined this rock in 1866, it is in lat. 25° 55' N., long. 124° 34' E., rising abruptly from a reef to a height of 270 feet above the sea.

Recruit Island.—At about 30 miles eastward of Raleigh Rock, another lofty island was apparently first seen on March 11, 1861, by Capt. J. Lyall, in the *Recruit*. It appeared, at a distance of 10 miles, to be 600 ft. in height, the same size and height as Ti-a-usu. It was again seen in 1863 and 1864 by Capt. R. Tatchell, in the brig *Speedy*, and he says that when it bears West, 12 miles distant, it has the appearance of two rocks. Capt. Crowdace, in the ship *King Lear*, describes it as only 90 ft. high, rising very abrupt; and when bearing West, northerly, a small rock standing erect, like a pillar in ruins, was seen detached from the North side. The four observations for its position coincide very nearly, and give a mean of lat. 25° 57' 40" N., long. 124° 43' E.

It seems most probable that this rock is the same as Raleigh Rock, the widely differing positions of which, as announced by various vessels, may be due to the influence of the Kuro Siwo, or Japan Stream, in which it lies.

This will conclude our descriptions of the islands of the North Pacific Ocean. The reader has been brought around its shores from Equatorial America along the sea-boards of its American and Asiatic boundaries, past countries of most widely opposite characteristics and interest. The islands which lie between these coasts have also been enumerated and described, and in these varied subjects we feel how great has been the increase in our knowledge and in their importance in the interval of 35 years, since the first edition of this book was issued.

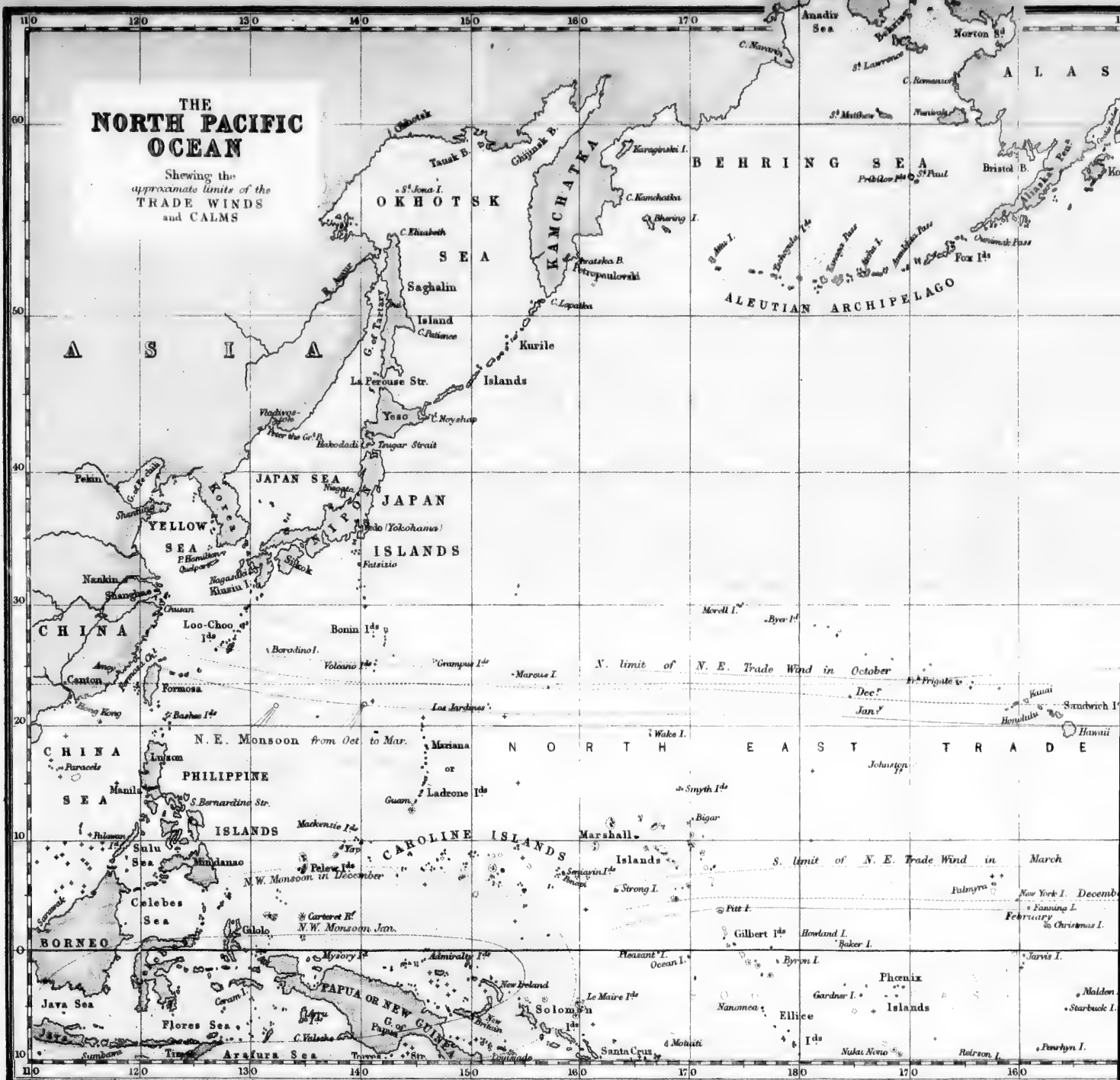
The continuation of its western limits is included in the companion volume, the Directory for the Indian Archipelago, China, and Japan. The various archipelagoes, the Philippine Islands, and the eastern groups of that great insular world which bounds the Pacific to the westward, are there fully described.

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THE NORTH PACIFIC OCEAN

Shewing the approximate limits of the TRADE WINDS and CALMS





SECTION IV.

THE PHENOMENA OF, AND DIRECTIONS FOR THE NORTH PACIFIC OCEAN.

THE preceding pages have been devoted to descriptions, more or less extended, of the features of the coasts and islands of the North Pacific, and including, incidentally, many notices of the peculiarities of the climate and meteorology of each region; there remains to be given a general view of the meteorology of the ocean in a broader sense. But in a few words it may be said that the arrangement of the phenomena in the North Pacific is so simple, and these are so easily applied to the service of navigation, that the ensuing remarks need not be enlarged upon, further than is needful to give a connected view of the subject.

What follows will be a brief account of the N.E. trades and the Anti-trade winds as experienced in the open ocean, and then a few remarks additional to what have been before given on the various sections of the coast. To these will be added an account of its currents, tides, magnetism, &c., and the concluding chapter will be devoted to the application of these phenomena to the best mode of making successful passages between the various ports.

CHAPTER XV.

THE WINDS OF THE NORTH PACIFIC OCEAN.

THERE is a general analogy between the meteorology of each of the great oceans, especially of the Atlantic and Pacific. This has been dilated on in each of the series of Directories, of which this forms a part, and therefore does not require much discussion here. In our North Atlantic Memoir especially, Section III, pp. 173—258, the arrangement of the wind-zones and the causes which lead to this arrangement are fully described. In the volume on the Indian Ocean, Chapter I, pp. 2—65, the peculiarities of the winds of that ocean are shown, differing as it does from the other great water areas in having the great continent of Asia at its northern boundary, on the division between the wind and current systems of the Northern and Southern Hemispheres. To this physical peculiarity the phenomena of the changing monsoons are owing.

The North Pacific more resembles the North Atlantic than the other oceans in its meteorology, but differs from that ocean in not having any connexion with the Arctic area, for the passage of Behring Strait is too shallow and too narrow to affect the general question. Further than this, the great area of the Pacific seems to exercise a deadening effect on the motive forces of the atmospheric and ocean currents which pass over it, both being of a more moderate character than in the Atlantic.

There are very considerable variations from the normal condition of the winds when near the land, where the effect of heat and season so greatly modify the aerial currents as to produce real monsoons on either side of the ocean. Many of these exceptional cases have been noticed in the preceding pages; others will be alluded to presently.

The general anemological arrangement of the North Pacific is thus:—The northward of about lat. 30° a parallel varying with the season) are found

the S.W. anti-trade winds; between that parallel and lat. 7° or 10° N. (also varying with the sun's declination) is found the N.E. trade wind, and between the last-named parallel and the northern limit of the S.E. trade wind is a narrow belt of calms or variable winds, to which the name of "*Doldrums*" has been applied; it is a well-known belt of difficulty to the sailor.

Captain Maury says:—"It has a mean average breadth (around the globe) of about six degrees of latitude. In this region the air which is brought to the Equator by the N.E. and S.E. trades ascends. This belt of calms always separates these two trade wind zones, and travels up and down with them. If we liken this belt of equatorial calms to an immense atmospherical trough, extending as it does entirely round the earth; and if we liken the N.E. and S.E. trade winds to two streams discharging themselves into it, we shall see that we have two currents perpetually running in at the bottom, and that, therefore, we must have as much air as the two currents bring in at the bottom to flow out of the top. What flows out of the top is carried back North and South by these upper currents, which are thus proved to exist and to flow counter to the trade winds."

The belt of calms follows the sun in his annual course, though the limits do not range so much in latitude as the sun does in declination, and generally they pass from one extreme of latitude to the other in about three months. The whole system of wind and calm belts moves northward from the latter part of May till some time in August; they then remain almost stationary till the approach of winter, when they commence to go southward, and proceed in that direction from December till February or March.

Owing to the unequal distribution of land and water in the two hemispheres, the relative proportions being in the northern hemisphere 100 land to 150 water; and in the southern 100 land to 628 water; and, owing to the great influence that the presence of land has on the aerial currents, the division of the two wind systems is always to the North of the Equator, that is, the mathematical and meteorological equators do not coincide.

The extent of the trade winds in latitude is usually considered to be from 30° S. to 30° N., but these limits are subject to so many variations, that such a statement must be received with great limitations. We have not the means of drawing such a close approximation to a true mean as can be done in the Atlantic Ocean, from the fewer recorded observations. The following table is given by the late excellent Ch. Ph. de Kerhalet, of the French Marine, as the result of ninety-two vessels which have crossed the line between the longitudes of 106° and 147° W.

At the end of this Chapter is a diagram, compiled from the "Wind Charts for the Atlantic, Pacific, and Indian Oceans," published by the Hydrographic Office in 1872 and 1879, prepared from various authorities. A careful study of this diagram will give a much clearer idea of the limits of the trade winds, at different seasons, than any verbal description.

Table of the limits of the N.E. and S.E. Trades, between long. 106° and 147° W., and the breadth of the interval between them in each month.

Months.	TRADE WINDS				Breadth of the intervening zone of calms, &c.
	Polar Limit.		Equatorial Limit.		
	Of the N.E.	Of the S.E.	Of the N.E.	Of the S.E.	
	Lat. N.	Lat. S.	Lat. N.	Lat. S.	
January	21 0	33 25	6 30	3 0	3 30
February	20 0	32 1	4 1	2 0	2 1
March	20 0	31 10	8 15	5 50	2 20
April	30 0	27 25	4 45	2 0	2 40
May	29 5	28 24	7 52	3 36	4 16
June	30 0	25 0	9 48	2 30	7 28
July	30 0	22 5	14 5	5 4	7 1
August	29 30	24 18	15 0	2 30	12 30
September	24 20	24 31	14 50	8 11	6 40
October	24 0	27 27	11 20	3 42	8 48
November	24 0	27 32	11 20	3 42	8 48
December	24 0	23 30	6 12	1 56	3 12

It will be seen according to this table and the diagram, that the polar and equatorial limits of the trade winds vary with the season, and remove farther from or nearer to the Equator, according as the sun has North or South declination; and that the breadth of the intervening zone in its eastern part is less in winter than in the summer of the northern hemisphere. In other respects this zone has much resemblance to the corresponding belt in the Atlantic, but is not so extensive. It is in reality broader between the meridians of 90° to 120° than farther to the westward, on those of 120° to 150° W. longitude; that is to say, the breadth of the calm zone diminishes according as you advance westward, precisely analogous to the wind system in the Atlantic, the recent knowledge of which has had such a marked influence on the trade equatorial voyages.

The term calm-belt is not precisely applicable to these equatorial doldrums, because, besides calms and light airs, variable between N.W. to South, by the West, storms, gales, and abundant rain are frequently encountered. Owing to the land influences before alluded to, the calm-belt lies northward of the Equator, its limits varying with the seasons, as will be seen from the illustrations & diagrams. But it sometimes occurs that the two trade winds meet each other without any intervening space of variables or calms.

The *North-East Trade Wind* needs but few remarks. Beyond the space of the eastern part of the ocean, where land influences modify or reverse its character, it is found to blow with steady but moderate force over the whole of the eastern part of the ocean. Towards its western part, that is, beyond

and about the Marianas, it is less certain in the summer months (April to September), and here the vanishing effects of the S.W. and N.W. monsoons are sometimes felt. The illustrative diagrams will afford the best insight into its area and limits in the various seasons. The Hawaiian group, which lies on its northern edge, or in the belt of tropical variables, from January to April, is included within its limits during the remainder of the year.

It will be noticed, on studying the diagram facing page 1192, that the *S.E. Trade Wind* stretches as a continuous belt across the ocean only in the months of July, August, and September. During the remainder of the year a belt of variable winds stretches diagonally from the Gilbert Islands to the Low Archipelago, thus breaking its continuity.

The *S.W. Anti-Trade or Passage Winds*, which occupy all the northern part of the ocean, will require still fewer words. It has all the general characteristics of the similar wind in the Atlantic, and perhaps is more persistent on the western side of the ocean. But here it is very much affected by the vast area of land it passes over, and reaching the ocean as a very dry and cold wind, it has a correspondingly severe effect on the climates of the northern parts of Japan, Saghalin, the Sea of Okhotsk, &c., which are proverbially inclement, and for a long period of the year completely ice-bound. On reaching the open ocean, where the great return stream, called the Japanese Current, runs to the north-eastward, carrying with it the warmer water of the tropical latitudes, this cold and dry wind so condenses the warmer vapours which hang over the current, that they are condensed into almost perpetual fogs. A similar and well-known region is found in the vicinity of the Banks of Newfoundland, but here these fogs extend far to the westward, and envelope more or less continually the extensive ranges of the Kurile and Aleutian Islands.

Dissolving these vapours and acquiring further humidity, and also increased temperature, in its further progress to the eastward and north-eastward, it is found on the Alaska coasts as a warm, rain-bearing wind, which deposits its abundant moisture on the coasts and islands of that comparatively unfrequented region.

Farther to the southward, in the territories of British Columbia, the climate, as is well known, is not subject to extremes of heat and cold on the coast regions, but within the range of mountains, which intercept much of this anti-trade wind, and consequently of its warmer moisture, the climate is much more severe. Of California, one of the finest countries in the world, and possessing every advantage of mild temperature and sufficient moisture, we have spoken elsewhere. A few words will follow.

As before said, the action of the land on these different aerial currents is very great, and can only be understood by a special description of each district. The following selection is given to afford this insight.*

* For further information relative to the temperatures and winds which prevail in various parts of America, I refer to the following works:

CENTRAL AMERICA.—On pages 4 and 5 are given some general remarks on the climate of the western coast of the great American isthmus. The following is by Lieut.-Comm. James Wood, R.N., who surveyed portions of the coast in H.M.S. *Pandora*. The first part of these observations refers to the coast to the southward of Panama, but will be useful to sailing vessels making this difficult port.

GUAYAQUIL RIVER TO GUASCAMA POINT.

The Intertropical.—Along the whole of the coast from the River Guayaquil, in 3° S., to Guascama Point, in 2° N., the wind is mostly from South to West all the year round, following in some measure the trend of the shores; the exceptions are few, and generally occur in the fine season. Both in beating up the coast to the southward, and in running down it, the former in the months of May and June, the latter in those of October, November, and January, we had the wind from S.S.E. to West (by the South), with a constant current to the north-eastward, the only difference being that the winds were lighter, and the weather finer in May and June as we got to the southward; whilst the contrary took place in October and November; and in January the weather was generally fine with moderate breezes. Within 60 miles of the land there is a constant current to the northward, of great assistance to vessels bound to Panama.

CHOCÓ BAY.—After entering the Bay of Chocó, of which Point Guascama forms the southern horn, the winds become more variable; but during the time we were in the bay (from the end of January to the middle of March) it never blew very fresh, though the weather was often unsettled, and heavy rains frequent. The prevailing wind was from S.W., but north westerly winds were not uncommon.

The following account by Dampier is perhaps as good as can be given:—"It is a very wet coast, and it rains abundantly here all the year long. There are but few fair days; for there is little difference in the seasons of the year between the wet and the dry; only in that season which should be the dry time, the rains are less frequent and more moderate than in the wet season, for then it pours as out of a sieve."

This kind of weather is found as far as Cape Corrientes, the prevailing wind being S.W., but N.E. winds are not uncommon. Off shore in this zone, between the parallels of 2° and 5° N., the winds are equally baffling, especially

the ocean, reference should be made to the "Wind Charts," mentioned on page 107, those drawn up by Lieutenant L. Brault, of the French Navy, published by the French Government in 1880, or to the Meteorological Charts of the North Pacific Ocean, published by the United States Government in 1878.

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during March, April, and May. H.M.S. *Alarm*, in March, 1859, only made 30 miles in six days.

CHIRAMBIRA POINT TO THE GULF OF SAN MIGUEL.—When past Chirambira Point (the northern horn of Choco Bay) we had the wind more from the northward, and in the latter end of March had to beat up to Panama Bay against north-westerly and north-easterly breezes, blowing a fresh breeze at times, especially as we approached the bay.

In surveying this last-named part in January, 1848, we found the winds more variable, heavy rains almost always accompanying a change to S.W., from which quarter we once or twice had a stiff breeze.

GULF OF SAN MIGUEL TO THE GULF OF DULCE, INCLUDING THE BAY OF PANAMA.

First, or Intertropical Winds.—Between the southern point of the Gulf of San Miguel and the Gulf of Dulce, including Panama Bay and the coast of Veragua, the winds are regulated by the seasons. During the fine season, commencing in October, the northers prevail. These are fine, dry breezes, which generally come on in the afternoon, and blow very fresh from N.N.E. to N.N.W. till near midnight, with a perfectly clear and cloudless sky, and the air so dry and rarefied that objects on a level with the horizon are distorted and flattened, and the same effects are caused as are seen during an easterly breeze off our own coast. Though generally a double-reefed topsail breeze, they occasionally blow much harder, especially off the coast of Veragua, where, in the months of January and February, even a close-reefed topsail breeze is not uncommon. During even the strongest of these, a dead calm often prevails 10 or 15 miles off the land, the only evidence of the gale that is blowing within a few hundred yards of you being the agitation of the water, which is raised into short hollow waves, which break on board and tumble you about awfully.

Towards the end of March up to the middle of April, the northers are not so regular, and have more westing in them, and are succeeded by calms and light sea and land-breezes, with occasional squalls from the south-westward. As April advances the squalls get stronger and more frequent, and by the latter part of May the rainy season generally sets in, during the greater part of which South and south-westerly winds prevail. These are not very violent within the Bay of Panama; but from Punta Mala westward, gales from the above quarters are frequent, and sometimes severe, bringing a very heavy sea with them. Still the old N.W. wind is mostly found after noon, and vessels sailing from Panama at all seasons will generally have a fair wind until South of Punta Mala.

BETWEEN THE GALAPAGOS ISLANDS AND THE COAST, westward of the

meridian of 80° , and southward of the parallel of 5° N., the winds are between South and West all the year round, and except between the months of February and June they are of sufficient strength and duration to make the navigation easy; but northward of lat. 5° , between 80° and 110° W., is a region of calm and doldrums, accompanied by rains and squalls of a most vexatious description. The weather met with can hardly be better illustrated than by the facts that in May, 1848, H.M.S. *Herald*, in her passage towards the Sandwich Islands, although towed for six days as far West as $89^{\circ} 20'$, still took forty days from Panama to 110° W., owing to keeping between the parallels of 8° and 10° N., and in March of the following year, in the meridian of 87° and the lat. of 8° N., only made 30 miles in nine days.

GULF OF DULCE TO THE GULF OF FONSECA.

From the Gulf of Dulce, proceeding westward along the shores of Costa Rica, Guatemala, and Mexico, we find the winds still follow the changes of the seasons, modified, however, by locality. For instance, whenever the northers prevail, we find them blowing off the shore at nearly right angles to the run of the coast; thus, as soon as the coast of Nicaragua is approached (which takes a more northerly direction than that before mentioned), we find during the fine season the northers exchanged for breezes called Papagayos. These blow from N.N.E. to E.N.E. or East, and are accompanied by the same clear fine weather as the northers; the prevailing wind, however, during the season (from January to April) is from S.E. to N.E. From May to November, which is the rainy season, the weather is mostly bad, gales from the West and S.W., with thunder, lightning, &c., being frequent, and at times violent.

GULF OF FONSECA TO THE GULF OF TEHUANTEPEC.

After passing the Gulf of Fonseca, where the land again trends nearly E. West, the northerly winds are lost, till on reaching the Gulf of Tehuantepec we meet them once more, but under a different name, and assuming a more violent character. Along this portion where the mountains approach, and even in some places form the coast-line, the winds during the fine season are the usual tropical land and sea-breezes; the former from N.W., the latter from South to W.S.W. and West. The remaining months are marked by even weather from the same quarters as is found on the Nicaragua coast.

FROM THE GULF OF TEHUANTEPEC TO TEJUPAN POINT.

Intertropical Winds—The heavy blasts which blow over the isthmus Tehuantepec derive their source from the country they cross. They seem to be caused by the northers in the Gulf of Mexico, which here find passage through the narrow channel between the Mexican and Guatemalan mountains. The prevailing wind from N. to N.N.E. in these a very high

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sea; their force is felt for several hundred miles off the coast. During the season when they prevail (December to April) every preparation should be made to meet and carry sail through them; if this can be done they are soon crossed, and 200 to 250 miles of westing (or easting) made; otherwise, if you are obliged to heave-to, 36 to 118 hours of heavy weather may be expected, exposed all the while to a very high and short sea. In the rainy season these cease; but the weather here, as along the whole coast of Mexico, is then very bad, gales and strong breezes from S.E. to S.W. constantly occur, whilst squalls, accompanied by thunder and lightning, with heavy and almost incessant rain, characterise the season throughout. These gales are at times very severe, rendering the navigation of such a coast very unpleasant, as, with one exception, there is scarcely any shelter from them to be found.

During the fine season, however, nothing can be more regular or quiet than the weather on the Mexican coast. A regular sea-breeze sets in about noon, beginning from S.S.W. to W.S.W., and getting more westerly as the sun goes down, decreasing with it, and gradually sinking into a calm as the night closes in. This is succeeded by the land-wind off the shore, which is more irregular in its direction and force; but these winds, and the method of making a passage to the westward along the coast, have been so well and so truly described by Dampier and Basil Hall, that nothing remains but to add my testimony to the correctness of the accounts they give as far as their phenomena fell under my own observation.

As soon as the coast begins to trend northerly again, which it does about Tejuapan Point, we meet the northerly winds which blow down the Gulf of California, and which are found pretty steady during the fine season a few miles off the coast; by taking advantage of these, and the daily variations caused by the land and sea breezes, the passage is made from this point to San Blas and Mazatlan; but it is always a tedious beat, owing to a contrary current and frequent calms.

WEST COAST OF MEXICO.

On pages 83 to 85 some remarks will be found from the pen of Commodore C. B. Hamilton, 1849, describing the winds and weather experienced on board H.M.S. *Frolic*. To these may be added here some observations taken from Captain Basil Hall's well-known work.

On the S.W. coast of Mexico, the fair season, or what is called the summer, though the latitude be North, is from December to May inclusive. During this interval alone it is advisable to navigate the coast; for, in the winter, from June to November inclusive, every part of it is liable to hard gales, tornados, or heavy squalls, to calms, to constant deluges of rain, and the most dangerous lightning; added to which, almost all parts of the coast are at this time so unhealthy as to be abandoned by the inhabitants. At the eastern end of this range of coast, about Panama, the winter sets in earlier than at San Blas, which lies

at the western end. Rains and sickness are looked for early in March at Panama; but at San Blas rain seldom falls before the 15th of June; sometimes, however, it begins on the 1st of June, as we experienced. Of the intermediate coast I have no exact information, except that December, January, and February are fine months everywhere; and that, with respect to the range between Acapulco and Panama, the months of March, April, and half of May, are also fine; at other times the coast navigation may be generally described as dangerous, and on every account to be avoided.

From December to May inclusive, the prevalent winds between Panama and Cape Blanco (Gulf of Nicoya) are N.W. and northerly. Thence to Reulejo and Sonsonate, N.E. and easterly. At this season, off the gulfs of Papagayo and Tehuantepec there blow hard gales, the first being generally N.E., and the latter North. These, if not too strong, as they sometimes are, greatly accelerate the passage to the westward; they last for several days together, with a clear sky overhead, and a dense red haze near the horizon. We experienced both in the *Conway*, in February, 1822. The first, which was off the Gulf of Papagayo on the 12th, carried us 230 miles to the W.N.W.; but the gale we met in crossing the Gulf of Tehuantepec on the 24th, 25th, and 26th, was so hard that we could show no sail, and were drifted off to the S.S.W. more than 100 miles. A ship ought to be well prepared on these occasions, for the gale is not only severe, but the sea, which rises quickly, is uncommonly high and short, so as to strain a ship exceedingly.

From Acapulco to San Blas, what are called land and sea breezes blow; but, as far as my experience goes, during the whole of March, they scarcely deserve that name. They are described as blowing from N.W. and West during the day, and from N.E. at night; whence it might be inferred, that a shift of wind, amounting to eight points, takes place between the day and night breezes. But, during the whole distance between Acapulco and San Blas, together with about 100 miles East of Acapulco, which we worked along, hank for hank, we never found, or very rarely, that a greater shift could be reckoned on than four points. With this, however, and the greatest diligence, a daily progress of from 30 to 50 miles may be made.

LOWER CALIFORNIA.

There is no good account of the meteorology of this portion of the western coast of America. But in some measure this is of less importance, inasmuch as it has few ports, and these but very little frequented by commerce. On pp. 130—131, and 178, some remarks by Mr. Jeffery, R.N., and Commander G. Dewey, U.S.N., are given. The following are by Commander Jas. West, and are in continuation of those given on page 1173 *ante*.

SAN LUCAS TO VANCOUVER ISLAND.

From Cape San Lucas to San Diego, or from 23° to 32° N., the general

March at Panama; sometimes, however, intermediate coast I and February are also fine; at as dangerous, and

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direction of the wind is from West to North, but during the winter months, or from November to April, this coast is subject to violent gales from the S.E., which, as most of the bays and anchorages are open towards that quarter, are much dreaded. This is especially the case along the northern portion of this division, as towards Cape San Lucas they are less frequent; however, they always give ample warning of their approach. The only way, therefore, of making a passage up this coast is by standing off upon the starboard tack; as you get out the wind draws to the eastward, till either the variables are reached, or you can fetch your port on the other tack. In the summer season the only alteration is that the wind is more westerly in the mornings, and draws round with the sun as the day advances.

From *San Diego to San Francisco* the wind prevails from the north-westward nearly all the year round. This coast is subject to the same south-easterly gales as the coast of Lower California, but they are more frequent here, and blow with greater force. All its bays and roadsteads are similarly exposed, with the exception of the above-named ports, which are perfectly secure, and defended from all winds. During the winter, therefore, vessels always anchor in a convenient berth for slipping, with springs and buoys on their cables, so that on the first appearance of heavy clouds approaching from the S.E., with a swell rolling up from the same quarter (the invariable signs of the coming gale), they may be able to slip and go to sea without loss of time. These gales last from twelve hours to two days, and are accompanied by heavy rain, which lasts till the wind changes, which it often does very suddenly, and blows as hard for a few hours from the N.W., when the clouds clear off and fine weather again succeeds.

Off Concepcion Point gales and strong breezes are so frequent as to obtain for it the appellation of the Cape Horn of California. They are mostly from North to West, and frequently blow with great force, especially in the winter, when they sometimes last for three days together, without a cloud to be seen, till they begin to moderate. But here one of the most remarkable features of this coast first shows itself, viz., the frequent and dense fogs, which, during more than half the year, render the navigation from San Diego northward most unpleasant. In making the land, the only way to deal with them is to feel your way into the coast with the lead during the daytime, as it frequently happens that a thick fog prevails at sea, while at the same time, within a mile or two of the land, a clear, bright sky, and open horizon are to be found; if disappointed in this you have but to wear, haul off again, and heave-to till the desired change does take place.

From *San Francisco to the Strait of Juan de Fuca* the north-westerly are still the prevailing winds; in the months of June, September, and October, we found them almost constantly so; hard gales from all points of the compass, however, may be looked for here at all seasons, especially during the winter and the equinoctial months. These begin generally from S.E. to S.W.,

N., the general

bringing thick rainy weather with them. After blowing from these quarters for some hours, they fly round to the northward (by the West), with little if any warning, except the increased heaviness of the rain, and blow even harder than before. During the spring, easterly and north-westerly breezes are more prevalent than at other seasons. In the summer months westerly winds and fine weather prevail; but from the end of July to the end of August, the fogs are so frequent that many weeks will sometimes pass without a clear day.

CALIFORNIA.

A general account of the winds on the western coast of the United States, as given in the excellent hydrographical memoir by Mr. Davidson, U.S.N., will be found on pages 206-7. The U.S. Government zealously collected materials for meteorological discussion along the whole of the coast, during the survey of 1855, and these have brought out the following general results:—

1. The great prevalence of westerly winds, representing a flow of the air at the surface from the ocean in upon the land.

2. The general absence of easterly winds, showing the absence of a return current at the surface.

The proportion of westerly to easterly winds is as 8 to 1.

3. The increase of westerly winds in the summer, and their decrease in the winter.

4. That when easterly winds blow at all, it is as a rule during winter.

5. The North, N.E., and East winds blow more frequently in the morning than in the afternoon hours.

6. The S.E., South, and S.W. winds are in general pretty equally distributed over the morning and evening hours.

7. The N.W. is the prevailing direction of the ordinary sea-breeze at Astoria and San Diego, and the West at San Francisco.

Sometimes the West wind has that character at the first-named stations, and sometimes the S.W. wind at the last-named.

As some of the details connected with these observations will be of service to our readers, they are here furnished.

San Francisco.—At San Francisco the great current of air flowing from the sea to the land comes generally from the West or S.W., rarely from the N.W.

In the period from November to March, inclusive, the West is the prevailing wind, exceeding in quantity both the others, the S.W. wind exceeding in quantity the N.W. In the period from April to October the West and S.W. winds are nearly equal, and each exceeds the N.W.

The West wind has, in general, the features attributed to the sea-breeze, beginning after the rising of the sun, increasing until after the hottest part of the day, and dying out or much diminishing at nightfall.

The West and S.W. winds are prominent features at San Francisco

The S.W. is the prevailing wind in June and July; S.W. and West winds

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blowing nearly the whole of these months, not succeeded by an easterly land breeze—but rising and falling. May and August resemble each other, the N.W. and S.W. winds being nearly equal in quantity, and each less than the West wind. In April and September the N.W. wind has nearly died out. The West wind diminishes in quantity through March and February, and through October, November, and December, to January. The N.W. wind increases again from April towards December, but is very small in October and November. The S.W. wind disappears in October, reappearing in November and December, and increasing towards January. The West wind has a maximum in April and May, and another in September and October, the minima being July and January.

The North wind in December, January, and February, reaching a maximum in January, is the only other point to be noticed for San Francisco, partaking with the other places in the general absence of easterly winds, although these show themselves slightly in winter. There is also but little South wind.

Astoria and San Diego.—In general, the winds at these two places resemble each other more than those at San Francisco do either. April, May, June, July, and August, have the same general character.

The N.W. wind is the summer wind, and has the characteristics of the sea breeze, but there is no return land breeze. The N.W. wind reaches a maximum in July, and a minimum in December. It is the great prevailing wind of the year at San Diego. As it decreases it is generally replaced by West and S.W. winds of less quantity. In December the quantities of the three winds are nearly equal.

The resemblance of these winds at San Diego and Astoria is remarkable, the remarks just made applying generally to both places. There is, however, much less N.W. wind at Astoria than at San Diego. Except in June, July, and August, there is some South wind each month at Astoria, and especially from September, through October, November, December, and February. At San Diego this is less marked, the two agreeing most nearly in quantity in March, April, and May.

The S.E. wind is a distinct feature in both places in February and March, and at San Diego in April and June.

The East wind is prominent at Astoria in January, February, and March, and the N.E. from October to January, inclusive.

Astoria has the most easterly wind, the N.E. beginning in October and blowing until February, and being replaced by the East wind in March.

The summer is the windy season on the West coast, July being one of the windiest months of the year.

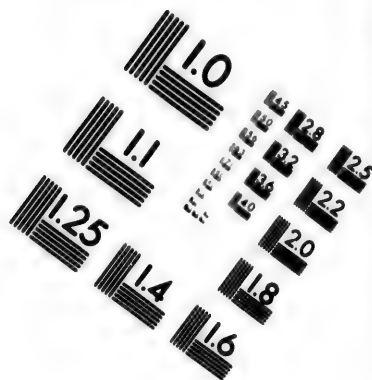
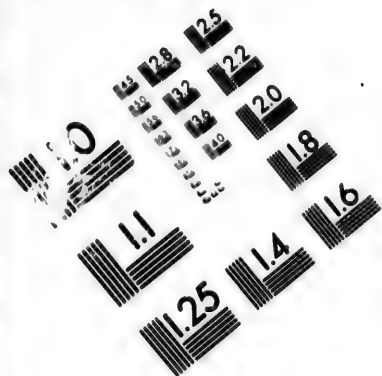
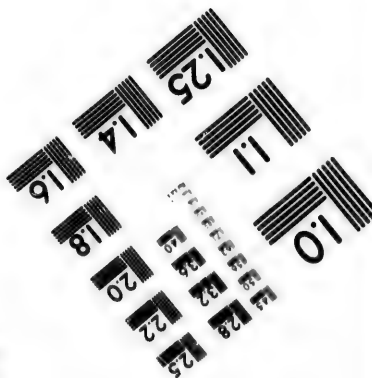
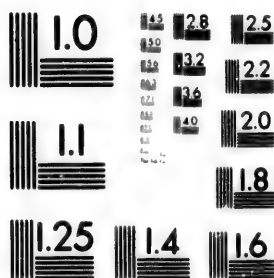


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VANCOUVER ISLAND, ALASKA, &c.

Capt. G. H. Richards, R.N., in the excellent Pilot for the southern portion of British Columbia, has given the remarks quoted on pages 390—392, and these, with other authorities mentioned in that part of our work, will amply suffice for this portion of the subject.

Of the meteorology of the coast northward of this our acquaintance is much more limited, for, with the exception of Sitka, we have but few remarks on the climate of this remote and unfrequented region. On pages 514 and 592-3 are given the general results of the observations on climate, &c., especially those derived from fourteen years' *hourly* observations at the Imperial Observatory at Sitka, the one great feature being clearly shown,—that the average number of wet or foggy days per annum was *two hundred and forty-five*.

Although of old date, we give here the observations of Admiral Krusenstern, which embody the experience gained up to the date of the great Pacific hydrographer's labours.

Humboldt supposes that between Behring Strait and the 5th degree of North latitude there prevail North and South monsoons, that is to say, from the month of May to that of October winds from S.S.W. and S.E. are met with, and from November to April those from North and N.E. It does not seem, however, by the voyages of Cook, Vancouver, and other navigators who have frequented the N.W. coast of America, that these winds succeed each other regularly; and if sometimes winds blow oftener from South during summer, and from North during winter, I do not think from this that we can establish a general rule; for S.E. winds are also very frequent in winter, and it is with a violent S.E. wind that winter sets in. We find, also, the opposite to the rule, and that only N.W. winds blow during summer. It is certain that the S.E. winds, whether those blowing in summer or in winter, are always accompanied by bad weather, by fogs and rain; and, on the contrary, the N.W. wind is accompanied by dry weather, and oftenest with cold weather.

I will adduce some examples, taken from the journals of the more celebrated navigators who have visited the N.W. coasts of America, to show that the winds have here too little regularity in their direction to give them, as Humboldt does, the name of monsoons.

Cook, while on the coast of America in the month of March, in lat. 44°, had constant and very fresh breezes from N.W., which accompanied him during his navigation towards the North until the beginning of summer; he met with, it is true, from time to time, gales from the S.E., but they were but sudden shifts, and did not commonly last more than six hours, after which the wind reverted with great force to the N.W., and it was only by means of these short breezes from the S.E. that Cook could work his way to the North. It is seen equally by the voyages of La Pérouse, Portlock, and Dixon, that southerly winds do not predominate during the summer months.

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Although Vancouver, when surveying the coast of America in the middle of April, 1792, that is, towards the end of the northerly monsoon, experienced violent gales from S.E. and E.S.E., with continued rains, and, although up to 50° of lat. the winds blew continually from the southern quarter, yet when he came on to the coast in the ensuing year, following it upon the same parallel and in the same season, that is, mid-April, he met with fresh northerly winds as far as his arrival in Nootka Sound. It is true that, in the month of September, in the same year, he met with some breezes from S.E. to S.W., but he also had them from N.W. In the month of December, 1792, on the contrary, being under the parallel of Port San Diego, in lat. 32° 42' N., the winds blew constantly from the South. These accompanied them to the parallel of 30°, although they ought to have blown from the North if these winds change regularly. Thus it is winds from the northward, and particularly from the N.W., which blow the most frequently, and occasion, as Vancouver says, a great hindrance to any advance to the northward; the Spaniards, consequently, in general keep a long way off the coast, running much to the northward of the parallel of their intended destination, to arrive at it more readily. Vancouver believes that they push this precaution too far; he is of opinion that, by the aid of the land-breezes from East and S.E., the duration of which is longer, and which have also greater force than the sea-breezes, any port may be attained. This opinion of Vancouver is correct, at least for the navigation from the Bay of San Francisco, in lat. 30°, to Concepcion Point, in 34½°, and even farther North.

Near to the Bay of Kenay (or Cook's Inlet), Kodiak Island, and Prince William's Sound, Vancouver found, in March and April, most frequently winds from N.W. and North. In May, June, July, and August, 1794, the winds often blew from S.E. and East, with great force, but not less frequently than from N.W. and S.W. Although Capt. Meares had a very strong wind from S.W. under the parallel of 50°, and that during the months of June and July the winds come more frequently from South than from North, he says, nevertheless, (page 234 of his Voyage), that during the summer months westerly winds prevail as far as 30° of latitude, with as much regularity as easterly winds prevail from 30° to the Equator.

I am indebted to Capt. Hagemeister, of our marine, for some notice on the predominant winds and currents in this part of the globe, and which he had collected during a navigation of several years on the N.W. coast of America. These notices merit the greatest confidence, being the result of a great number of observations made with the most scrupulous exactness, particularly at New Archangel in Norfolk Bay, and at Port Ross (Port Bodega), on the coast of New California; both lie within the limits which I have given to the first zone. It results from these observations, as well as from those already cited, that northerly winds are not the exclusive attribute of winter, as those of the South are not of summer, but the contrary frequently takes place.

By the observations made at New Archangel in lat. $57^{\circ} 9' N.$, it seems that it is easterly winds, accompanied with rain and snow, that are predominant in winter. At the beginning of December there are frequent squalls and tempests, which do not occur in summer, and towards the end of this month the Aurora Boreales are very strong. About Cape Chirikoff, in lat. $56^{\circ} 9'$, the currents have a constant North direction, and often with a velocity of 2 miles an hour. The direction of the current along this coast is in general towards the North; near to Port St. Francis it takes a West direction, toward Prince William's Sound and the entrance to Cook's Inlet, after which it turns toward the South, along the coasts of Kodiak. The remains of vessels shipwrecked on the American coast are often found about the southern part of the island of Kodiak; among them those of Japanese vessels, which are recognised by the camphor-wood of which they are built.

The following remarks are by Mr. W. H. Dall, Acting-Assistant, United States Coast Survey, as published in the Pacific Coast Pilot, Appendix i., 1879, Washington.

The average opinion, as expressed by ship-masters, in regard to the winds which may be looked for between Bering Strait and San Francisco is about as follows:—

A belt of north-westerly winds separates the Alaskan area of variable winds from an area of S.W. winds and calms which extend in a general way along the parallel of $30^{\circ} N.$ and northward from it. At the season when the spring or outward passage is made (March to May), the north-westerns are generally feeble, and the winds more or less variable. But the home passage (July to November) is made when the winds are well characterized, and these navigators assert that they strike the belt of north-westerns about lat. $45^{\circ} N.$, and, if they can get a north-westerly breeze from the Fox Islands or Kodiak strong enough to carry them to lat. 45° , they are sure of a continuance, and of making a good passage.

Sitka.—The beginning of the year is marked by a predominance of northerly and easterly winds with a southward tendency as the season advances, south-westerly and westerly in July and August, after which the easterly winds again predominate. North-westerly winds are at no time numerous. Calms are particularly prevalent in July and August, light breezes in May and June. At the equinoctial periods, and at intervals during the winter, heavy gales are experienced. The winds which bring fog, rain, and storms, blow out of Sitka Sound, and those which clear the atmosphere are favourable for entering it. Obstruction by ice is unknown.

St. Paul, Kodiak.—The rule that N.W. and S.E. winds prevail more frequently than others is confirmed by experience throughout this region. The summer winds are generally light, those of spring and autumn heavy, and severe gales, almost unknown from April to October, occur at intervals in winter, especially in February.

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It is the experience of navigators leaving this port in the autumn, that if they can take advantage of the rise of a strong north-wester, it can generally be held until the vessel nears Cape Mendocino. Sometimes, indeed, it carries the fortunate craft well in by Point Reyes before dying away.

Iliuliuk, Unalaska.—The winds are pretty evenly distributed. May, June, and July, are marked by numerous calms. The equinoctial periods are peculiarly liable to severe south-easterly and south-westerly gales.

St. Paul Island.—The prevalent directions of the wind seem to be northerly and southerly. In winter, N.W. winds are least prevalent of any; the same is true of S.W. winds in summer; in spring, northerly winds predominate. Calms seem more numerous in winter. The winter gales, especially those from the S.W., rival those of Antarctic seas in their severity. The gales most justly dreaded are those from the South and S.E., usually accompanied by thick weather, squalls, and rain.

BEHRING SEA.

Till of late years there was no complete account of the climate or winds of this inclement region, and to derive it from the individual experience of the various navigators who have recorded their knowledge would but give a fallacious view of the subject, as the features of its different shores vary greatly from each other. Among the northern islands it is as humid and disagreeable as possible. Spring does not begin till May. Dense fogs prevail throughout the summer; snow falls in October, and in December the North winds bring the ice, which remains frequently till May. Farther South, at Behring and Copper Islands, the climate is not so rigorous, as explained on page 723.

The following remarks are by Mr. W. H. Dall.

During the year nearly 50 per cent. of the winds in the region of Alaska and Bering Sea blow from the average directions of North, N.E., and East. From April to September only 25 per cent. of the winds come from the average directions of West, N.W., and North, while from N.E. and East, S.W. and South, 63 per cent. of all the summer winds proceed. From October to March 60 per cent. of all the winds come from the North, N.E., and East; only 14 per cent. from the South, S.E., and S.W.

St. Michael's, Norton Sound.—It appears there is a general predominance of North, N.E., South, and S.W. winds over all others. North-easterly winds are particularly prevalent from October to February. The winds in summer are usually light.

Anadyr River, Eastern Siberia.—The prevalent winds at the mouth are north-westerly, summer and winter, with those from the S.E. next. Calms were least rare in January and October, which also furnished a larger per-centage of gales than other months.

KAMCHATKA.

On the S.W. coast of Kamchatka easterly winds prevail in summer, varying between N.E. and S.E., with frequent calms, while westerly winds are constant from September till May, and are frequently very stormy. Westerly winds in summer bring bright fine weather, while easterly winds bring snow or rain. Some further remarks are given on page 731.

On the East coast a falling barometer indicates a southerly or south-westerly wind, with clear weather; and a rising, or high barometer, foretells northerly and easterly winds, with foggy and disagreeable weather. On the West coast, however, the reverse happens, as foggy weather sets in with southerly and S.W. winds, and fine weather with easterly winds.

At Petropavlosk there is a decided preponderance of N.W. and S.E. winds; S.W. winds appear very rare. In summer, light winds are the rule. Navigation opens about June 1, and closes about November 24. In leaving this port, or the Okhotsk Sea, for San Francisco, in October, as is usually done by American fishermen or traders, it is almost the invariable experience of shipmasters that, when four or five days out from port, very severe gales from the N.W. are encountered, and these often last for several days.—Mr. W. H. Dall.

SEA OF OKHOTSK.

According to M. Tesson, the prevailing winds on the northern and western shores of the Sea of Okhotsk, during June, July, and August, are from the southward and eastward, and seldom from any other quarter, moderate, with either fog or rain. In September, about sunset, the wind, which during the day is from the southward, veers to the westward or north-westward, and remains fresh from that quarter during the night. During the whole of this month the sky is clear, and the wind moderate. About the beginning or middle of September southerly gales are said to be experienced, but this month has in other respects finer weather than August. From the middle of October to December stormy weather and gales may be expected, with winds from East and S.E.; when the wind is North and N.W., fine weather follows.

From December to April the wind is from North to N.E., fresh, with a clear sky; bringing snow if it hauls to the eastward. In April and May the winds are moderate, from North during the night, and South in the day.

Near the *Kurile Islands*, the winds during the summer months are said to be variable; with winds from S.S.E. to S.S.W. the weather is usually foggy, but the sun is often visible through the fog; East and N.E. winds bring rain and bad weather; with the wind from N.N.E. to N.N.W. the weather clears, and the temperature is cold; it is also cold with the wind from N.N.W. to W.S.W., and the air is dry and hazy. With the wind between S.S.W. and W.S.W. the sky is clear, and fogs are rare.

Fogs are nearly constant in the Sea of Okhotsk; they are most dense with S.E. or easterly winds, and off-shore winds disperse them.

Okhotsk.—Very little rain falls here, only 4½ inches per annum. Except in summer, the winds blow almost exclusively from the northward, and from October to March there is hardly any but a northerly wind. Calms are most prevalent in May, June, and July. Strong winds are most noticeable in March and September, and least so in December. Navigation is open on the average by June 5, and closes by October 17.

Aian.—The winds here are chiefly from N.E. and N.W., the former predominating in spring and autumn. The most severe winds occur between September and February. Navigation opens about June 11, and closes about November 30.—*Mr. W. H. Dall*

GULF OF TARTARY.

In the Gulf of Tartary and La Pérouse Strait, from January to March, inclusive, northerly winds are said to prevail, veering from N.E. to N.W., with frequent gales and snow storms. In March the wind hauls to eastward. From April to August, inclusive, the wind is from the southward and eastward, the prevailing winds between April and July being between South and S.E., veering occasionally to E.N.E.; these easterly winds bringing very foggy weather. Moderate S.S.W. winds at times intervene, and bring fine clear weather. At times the sea is as smooth as a mirror. Sometimes the S.E. wind is high and squally, and occasionally in May a furious south-easterly gale and snow-storm, lasting ten or twelve hours, has been experienced; they may be expected with a previously freshening breeze from the East and S.E., and sometimes a rapidly falling barometer; the wind in these storms rises and falls suddenly, and will most probably veer to the South, S.W., West, and perhaps N.W. Winds from N.W. during this period of the year are of short duration.

In September the wind becomes variable, north-easterly winds being the most prevalent, and generally blowing from that quarter round to the N.W., West, and S.W., with fine clear weather after the middle of August, when the fogs, which are almost continuous from March until that time, disappear. About the time of the equinox unsettled weather is experienced, and gales are frequent. In October westerly winds predominate; they commence at S.W., but soon haul round to West, and ultimately settle at N.W., from which quarter it generally blows strong, gales lasting often two to four days.

From October to December, inclusive, North, N.W., and sometimes N.E. winds prevail, frequent snow-storms accompanying winds from the latter quarter. The principal direction of the wind, however, during winter, is W.N.W. and N.W.

In the *Amur River*, during spring and summer, S.E. and East winds prevail, often accompanied by fog and rain; calms are rare, and westerly winds in

summer bring fine weather. In autumn the wind is from West and N.W., generally blowing strong.

The barometer in May, June, and July, 1855, ranged between 29.65 and 30.28, falling once to 29.0 in a heavy south-easterly gale. During winter it is always high, sometimes as high as 30.56.

The following remarks are by Mr. W. H. Dall.

Nikolaieffsk, Amur River.—Westerly and easterly winds predominate; northerly and southerly ones are almost unknown. June, July, and August have a great predominance of south-easterly winds. August, September, and October have the largest per-centage of calms.

Dai, Saghalin Island.—The winds present a decided predominance of northerly and southerly breezes, somewhat fewer from the eastward, and very few from westward. Southern winds predominate in summer. July and August afford the most calm weather.

At *Kusunai* the prevalent winds are from the East and West, and at *Muravioff Post* the most prevalent winds are from the West, East, and S.W.

JAPAN.

On pages 779—782 are some remarks upon the climate of Japan, and we here give some further particulars as to the prevalent winds, as given in the "China Sea Directory."

Though there are considerable local variations in the direction of the winds along the extensive sea-board of the Japanese Archipelago, the following appear to be the normal changes which occur throughout the year. The prevailing wind is from the northward, variable between N.E. and N.W., or off the land, the average wind being N.E.

From January to March, inclusive, winds from the northward and westward prevail, shifting occasionally to the North or north-eastward. From April to June the winds are light and variable, principally from the northward round to West, and sometimes S.W., with frequent calms; the latter end of May and the whole of June is said to be the rainy season on the South and East coasts, the winds are then variable, but haul to the southward towards the middle of June.

From July to September warm southerly winds, variable between S.E. and S.W., prevail, winds from S.E. being more prevalent during August and September than in any other months. The weather is unsettled about the period of the autumnal equinox, and the wind becomes variable, continuing so until the middle of October, but gradually settling to the north-westward, and becomes tolerably steady from that quarter about the latter part of that month. In July thunder-storms are of frequent occurrence.

From October to December, inclusive, moderate northerly winds, from N.W. to N.E., prevail, with fine weather; a bright day with a clear sky being

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Gales.—Ordinary gales occur frequently throughout the year, their prevailing direction being from seaward, between S.E. and S.W. In the winter months, gales from N.E., S.W., and West, are often experienced near the coast. The barometer generally rises previous to a gale from the northward, and if it fall after a strong N.E. wind has set in, bad weather will follow. Before a southerly gale the barometer falls, and frequently a long heavy swell rolls in from the southward.*

From November until May local gales blow down the numerous channels and gulfs, especially in the Boungo and Kii Channels, and the Gulfs of Owari, Suruga, and Yedo, frequently lulling at the sun's or moon's setting.

Barometer.—From December to February, inclusive, the mean pressure over the Japanese Archipelago varies from 30.10 to 30.30, the lowest isobar in these months being farthest inland, whilst the highest follows the line of coast. In March, April, and May, the pressure is more evenly distributed than at any other period of the year, excepting November. The weather during these months is very fine, though moderate rain falls, increasing in the latter month. In June, July, and August, there is great variation of pressure over the southern portion of Japan, more especially on the S.E. coast. In October the pressure increases, and much rain falls on the S.E. coast. In November the pressure is nearly equalised, and the weather is fine.—*Staff-Commander T. H. Tizard, H.M.S. Challenger, 1875.*†

On the East Coast; the prevailing winds during the winter, November to March, are between North and West. If the thermometer rises much above 30.011 easterly winds may be expected, lasting from one to two days, with fine weather; the barometer then falls, and the wind becomes variable, with rain. Should the wind "back" through North and N.W., and the barometer fall to 29.607, a westerly gale may with certainty be expected.

Easterly gales set in with a high barometer and very cold weather, the barometer remaining stationary until the wind veers to N.E., when, should the barometer then fall, more bad weather may be expected. When they occur

* Off Yedo, in February, 1863, H.M.S. *Swallow* experienced a sharp gale of ten hours' duration, with little or no warning. The sky was very clear, with steady falling barometer, and in two hours the ship was reduced to close-reefed main-topsail, &c. In August and September, 1858, H.M.S. *Furious* experienced heavy gales from E.N.E., shifting round to the southward and westward.

† "Contributions to the Meteorology of Japan," published by Authority of the Meteorological Committee.

‡ The following local particulars are principally abridged from a Paper on the Meteorology of Japan, by Capt. Kleinmann, in the *Annalen der Hydrographie*, Heft. ii., 1881.

at the periods of full or change of the moon, they are usually very violent Northward of Kinghsan, towards Tsugar Strait, easterly winds hang to the E.S.E., bringing thick weather, snow, and rain.

As a rule, the barometer falls before westerly gales set in, and rises before easterly gales appear.

Towards the end of March the westerly winds decrease both in force and frequency; and during April and May the weather is fine, with light variable winds. The winds during the summer months are chiefly from between South and East, the latter being accompanied by rain. Fogs are experienced all along the East coast at this season. During October the weather is changeable; winds from North and West preponderating.

In the Seto Uchi north-westerly winds prevail throughout the winter months, with dry, clear, and bright weather. After March unsettled weather, with haze and occasional rain, continues for a short time; and in the summer months light variable winds, principally from the N.E. and S.W., with frequent calms, are experienced. Gales occur at the equinoxes, sometimes blowing hard, from S.W., for a day or two; they almost invariably veer "with the sun," and blow hardest from West to North.

In the Gulf of Yedo, during spring and summer, very violent and sudden squalls from the North come on frequently without any warning from almost a calm. These squalls have also been experienced by vessels passing between Yokohama and Hakodate.—*Capt. C. S. Stanhope, H.M.S. Ocean, 1868.*

In March, April, and to the middle of May (when the rains commence), the climate is delightful, as it is also in autumn. In summer the maximum temperature in the shade is 86°, and the evenings are cool and pleasant. In July and August, which are the hottest, South winds, with a little westing, are prevalent in the gulf.

From information obtained at Yedo, it appears the prevailing winds throughout the year are to the northward of East and West, and that those to the southward generally bring bad weather; always, however, causing the barometer to fall in sufficient time to enable a vessel to obtain a 60 or 80 miles offing, should she be near the coast.

In spring and summer westerly winds are generally experienced between Siwo misaki, at the entrance to Kii Channel, and Mikomoto, on passing which, the westerly wind falls, and a N.E. wind is often found blowing strong down the Gulf of Yedo.

Strong winds from the S.E. are generally accompanied with thick weather and rain. At such a period it is recommended that a vessel bound to the westward from Yedo should run through the chain of islands to the southward of Van Diemen Strait, instead of passing through the strait; for by taking this latter route, and not making sufficient allowance for the north-easterly current, she would in all probability find herself embayed on a lee shore to the northward of Cape Chichakoff and possibly of Cape D'Anville (Toyi misaki).

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During H.M.S. *Saracen's* survey of the *Strait of Tsugar*, May, June, July, and August, 1855, the prevailing winds were from the South, with much fine clear weather. The wind was less frequent from the N.W. than any other quarter. Dense fogs prevailed in May and June. The wind in shifting usually followed the course of the sun. After a few days of light southerly wind and fine weather it freshened, and veered to the westward, accompanied by fine clear and cold weather. At N.W. it usually died away, or flew round suddenly to the eastward; in the latter case it was always followed by a dense fog or a gale; the weather getting fine again as the wind veered to the southward. (See also pp. 854-5.)

Yezo Island.—From January to March the wind is westerly from North to S.W., but strong N.W. winds prevail. April is very unsettled; N.W. winds prevail until the middle of May, when the wind hauls to the southward. Southerly winds, variable between West and East, with occasional calms, prevail until the end of June, and gales are not unfrequent. In July and August light variable winds from the southward, between S.W. and S.E., with occasional calms and fine weather, are experienced. In September the weather becomes unsettled, and gales are of frequent occurrence. During the winter months westerly and north-westerly winds are said to blow almost continually, and usually with great violence.

On the South and East coasts, winds from S.W. round seaward to N.E. bring fog almost without exception, whilst those off the land, or from West to N.E., are accompanied by fine weather. Fogs make their appearance early in June, increasing in density and duration until August.

At *Hakodate* the barometer is highest in October and November, and the most rain falls in July and August during easterly winds. N.W. winds set in in the latter part of October, and continue until March; S.W. winds prevail in April; South in May; S.E. in June; and East in July and August; the wind gradually veering round during spring and summer from S.W., round by South, to East, suddenly flying back again to West at the autumnal equinox. North winds seldom blow here, while N.E. winds are rare. The break up of the warm weather at the end of August, or early part of September, is usually accompanied by one or more typhoons, the centres of which invariably pass westward of *Hakodate*.

Kurile Islands.—Little is known of the meteorology of this locality; the islands are said to be constantly enveloped in fog. On the Pacific coast, from January to March, northerly and north-westerly winds are said to prevail, and throughout the winter much heavy weather, with frequent strong gales, accompanied by snow and sleet. From April to June south-easterly winds prevail, with frequent calms. From July to September winds from the southward,

variable between West and East, prevail, with occasional calms. Westerly winds set in in September, and prevail principally from N.W., from which quarter they blow violently throughout the winter.

West Coast of Nipon.—During the winter months strong West and N.W. winds prevail, blowing so continuously as to produce a very high sea all along the West coast of Japan, so that only powerful steamers can navigate this coast, with any security, during the winter season. Vessels bound northward at this season should keep along the Tartary shore, where finer weather will be experienced.

Towards April the weather becomes finer; May brings easterly winds, with rain, and the summer is very wet. During summer South and S.W. winds predominate, with fine weather, but they are very changeable. Fogs occur during the summer months.

On the West coasts of Japan, including the Japan Sea, Korea Strait, and the northern part of the Eastern Sea, the weather is as follows:—In the spring, from about March to June, and sometimes in July, the winds are almost constantly from the eastward, veering between N.E. and S.E.; moderate in force, with mist and rain, and gloomy skies. It frequently freshens up to a strong breeze, with squally weather generally from N.E. Calms and light westerly winds occur in small proportion, and bring beautiful weather.

There are occasional strong gales, sometimes of five days' duration, the wind freshening up from the East (generally commencing from S.E.), with falling barometer, and blowing with variable force for three or four days, then chopping round suddenly to South, or veering to North and N.W., according to the quarter of the passing storm, when the gale attains its maximum force, and blows itself out in a few hours, or in one or two days, according to the season. The barometer gives good warning. The gale always attains its height after the mercury has commenced to rise, and usually blows with the greatest violence from the N.W. Small cyclones of short duration are also known in June; they travel northward, but later in the year between N.E. and East. Gales set in generally with but little warning, the only prognostic being a heavy swell. The barometer falls quickly, and the gale commences from S.W., accompanied by blinding snow-storms; the wind may be expected at any moment to veer suddenly to N.W. in a heavy squall, then continuing to blow in furious squalls, alternating from N.W. to S.W.

On the S.W. Coast of Japan, during the winter, N.W. and westerly winds prevail, and often blow with great violence, accompanied by snow, hail, or rain, and a heavy sea. A strong S.E. wind, with much rain and a falling barometer, is a forerunner of a westerly gale with clear weather. In the summer East and S.E. winds prevail, with thick and rainy weather; June and July bringing fogs. August brings unsettled weather on the coast, with short

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gales from various quarters, squalls, rain, and frequent calms. During September and October, and in the early part of November, S.E. and S.W. gales sometimes occur, accompanied by heavy showers of rain. November brings the N.W. wind, which prevails in the Korea Strait and Japan Sea during the winter months. During January and February northerly winds with snow-storms occur, with a falling barometer.

In Van Diemen Strait northerly winds prevail for nearly eight months of the year; from September to December, inclusive, they are to the eastward of North (principally N.E.), while from January to March they haul to the westward, N.W. being the direction of the prevailing wind. During the summer months the wind is either from the East or West.

Sea of Japan.—Comparatively little is known regarding the meteorology of this sea. According to Krusenstern, "North and N.E. winds blow for ten months in the year on the East coast of the Korea, and if sometimes they change to the South during this time, which is rare, it is only for a short time."

From January to March, inclusive, northerly winds prevail on the Korean coast, hauling to the westward, in the middle of the Japan Sea; on the coast of Tartary southerly and south-westerly winds prevail, and on the East coast of the Japan Sea westerly and north-westerly winds and calms are experienced. From April to June the winds are variable, but light southerly winds prevail, with frequent calms and fine weather, especially between the parallels of 40° and 45° N.; the wind hauls to the eastward on the coast of Japan. From July to September, on the Korean coast, moderate northerly winds prevail, with fine weather in September. In the northern part of the sea, fogs and rain last until August. Fogs prevail from April to June, inclusive, all over the Sea of Japan, and are most dense in June.

In the Sea of Japan violent squalls occur at all seasons, but more especially in the winter. Gales occur at the equinoxes, generally commencing at S.E. on the coast of Japan, and veering to the southward and westward.

In summer, in the western part of the Japan Sea, light easterly winds are predominant, with much fine weather and thick fogs, but much more variable than in the spring, and subject to short, sharp breezes, veering with the sun. Towards the end of August they alternate with westerly breezes.

About the autumnal equinox the weather breaks up between the parallels of 41° and 46° N. In the middle of September, 1859, a heavy cyclone was experienced (exceeding 500 miles in diameter and progressing to the N.E.) at St. Vladimir Bay and Hakodate at the same time, and was the heaviest storm known at the place for forty years. There occurred between this and the middle of November twelve other gales, ten of which were cyclones, and two "blue north-westerns," their force from 7 to 10, their duration two to four days, with intervals seldom of more than two or three days' fine weather be-

tween them; the normal direction of the wind was from S.W. to N.W., with fresh and strong breezes.

Southward of 50° N., November was fine with light N.E. and N.W. winds. The N.W. winds became prevalent towards the end of the month. At Hakodate they blow for four months. In 1859, during the first eighteen days of December, the wind remained between N.W. and W.S.W. almost constantly, only veering occasionally as far as S.W. and North. The weather was fine when the wind was moderate, but very fresh breezes brought rain or snow.

THE ISLANDS.

The various archipelagoes and detached islands of the North Pacific are nearly all within the limits of the N.E. trade wind, and therefore the peculiarities of their meteorology are very simply explained. But as some of the chief of these groups, as the Hawaiian, the Mariannas, and the Carolines, lie on the northern, western, and southern limits respectively, it has been argued, perhaps fallaciously, that all the islands have a marked effect on the direction of the general wind. But when it is considered that the area of these islands, mostly coralline atolls, is so infinitesimally small, compared with the area which surrounds them, it cannot be conceded that these minute specks on the surface of the great ocean can exercise much influence on the great belt of the trade wind which blows over it.

Taking the Sandwich Islands as an example, it is shown in the description of that archipelago, pp. 1066—1068, that lying as they do just within the northern tropic, the N.E. trade blows without much intermission for nine months in the year, and that from December to January, that is when the sun is in the highest southern latitude, they are interrupted, and that the islands then are in the "horse latitudes" of the tropic of Cancer.

The Mariana or Ladrone Islands are also exceptionally placed. For hereabout is the division of the monsoon region and that of the N.E. trade. The S.W. monsoon evidently reaches the archipelago between the middle of June and the middle of October, but is only violent and changeable for a few weeks in the beginning or end of its season. During the middle, as in August and September, the air is calm, and the heat almost unendurable. This subject is further elucidated on pages 1039—1041.

The Caroline Islands lie on the southern verge of the N.E. trade, and are subject to all the vicissitudes of the change of seasons. Mrs. Gulick, one of a family to whom we owe much of our knowledge of the islands of the North Pacific, being the wife of a most zealous member of the Hawaiian mission, kept a meteorological register for three years, 1853—5, at Ascension or Ponapi, and from the results tabulated on page 973, it will be seen that the N.E. trade is only interrupted between July and November, at the time when this southern margin, following the sun in its course, passes to the northward, leaving the

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archipelago in the belt of calms or "doldrums," but which have not the characteristics usually attributed to this zone, as the number of calm days is generally fewer than is found to be the case in the zones either North or South of them.

In the descriptions of the other groups of islands will be found many notices of the climate and winds, which will be sufficient to give an idea of this simple subject.

The **MONSOONS** are described in our Directory for the Indian Ocean, pages 28—64, and in that for the Indian Archipelago, China, &c. pages 1 to 25. To those works, which are connected with the present volume, and to the accompanying diagrams, the reader is referred for a concise account of their origin and effect.

HURRICANES are but little felt in the open ocean in the North Pacific, and do not differ in their phenomena from those experienced in the other oceans. Some remarks on those which occur off the West Coast of Mexico, during the months of July to October, are given on pp. 83—85 and 119—120.

Typhoons.—The whole of the western portion of the North Pacific Ocean, between the parallels of 10° and 45° N., together with the China Sea, is subject to violent cyclonic storms, termed typhoons, which, between 20° and 45° N., are experienced from June to November, more particularly about the equinox. They are seldom felt within 5° or 6° of the Equator, and have not been traced into very high latitudes.*

Typhoons originate in tropical latitudes, and, according to Professor Dove, are caused by the upper winds forcing their way into the lower; but Professor Reye, in his work "Die Wirbelstürme, Tornados, und Wettersäulen," contends that the cause is the equilibrium of the atmosphere being upset by the caloric set free by the condensation of atmospheric vapour.

At the outset they usually take a W.N.W. course, but when the centre passes out of tropical limits they almost invariably re-curve, passing away to the northward, and then to N.E., expending their force in the open Pacific. Their average rate of progression off the shores of Japan is about 18 miles an hour. They blow in violent squalls, accompanied by heavy rain; in their centre the barometer sometimes sinks as low as 28 inches.

Capt. H. C. St. John, H.M.S. *Syleia*, makes the following remarks:†—The

* A more extended account of these cyclones, with rules for avoiding them, will be found in the North Atlantic Memoir and the Indian Ocean Directory. See, also, "A Barometer Manual for the Use of Seamen," issued by Authority of the Meteorological Council; and "Remarks on Revolving Storms," published by the Admiralty, 1883.

† "Notes and Sketches from the Wild Coasts of Nipon," 1880.

typhoons which occur in Japanese waters are, I believe, always distinct from the China storms. Originating in tropical latitudes their first course is to the N.W., the same as that of the Kuro Siwo. It appears they then pass over the same ground, gradually turning to the North with the warm current, striking the South coast of Japan, just as they incline away to the north-eastward. Their northern disc now becomes flattened in against the high mountain ranges. The general N.E. direction of the coast is then followed, until the S.E. corner of Nipon is reached, when they pass out to the open Pacific. The result of these circular storms becoming flattened on their northern semidiameter is that easterly winds prevail during their passage along the coast, these winds being exactly against the course of the current. The result of two such forces meeting is a horribly confused sea, alike trying to man and ship.

From long experience it became easy to foretell the approach of these disagreeable visitors. First, as a never-failing indicator, the barometer stands unrivalled. It must, however, be thoroughly understood before reliance on it can be felt, the ordinary rising and falling of the mercury being quite insufficient. Speaking generally, a falling barometer with the wind between N.W. and East (through North) is a bad sign. A long heavy swell setting in from the S.E., without any previous wind from the same direction, is another suspicious indication. The sun setting amongst high-banked clouds, and giving out copper-coloured rays, denotes some uncomfortable change. Birds coming steadily in from seaward, as if anxious to be near shelter, is a very certain fore-runner of bad weather. If all, or one or two, of these signs were observed at the same time, when the weather was otherwise bright, fine, and everything that is pleasant, my maxim was, "Get to a safe harbour." The falling barometer, and the swell setting in, generally gave forty-eight hours warning, but the other indications were less reliable.

When these storms occur, if a port cannot be reached, the next best thing is to get well away from the coast; at the same time the land hardly ever becomes a lee-shore, owing to the course these storms almost invariably take; and, in any case, if hove-to on the right tack, a good ship, properly managed, ought to weather it well.

It is a strange peculiarity of these storms that they frequently travel in pairs. On two occasions I experienced this; the interval in each case between the passage of the storms was three or four days.—*Capt. H. C. St. John.*

The deflecting influence of the Kuro Siwo was seen in the typhoon of September, 1878, which Mr. E. Knipping, of the Marine Office, Tokio, has made the subject of an elaborate investigation, in Heft xviii of the "*Mittheilungen der deutschen Gesellschaft.*" Mr. Knipping has also published several other valuable pamphlets on typhoons occurring in the vicinity of Japan.

In the night of August 20—21, 1874, a typhoon commenced at Nagasaki. In the course of the day the barometer had fallen from 759 millimetres (29.88 in.) in the morning to 743.5 at 6 o'clock in the evening; in the next

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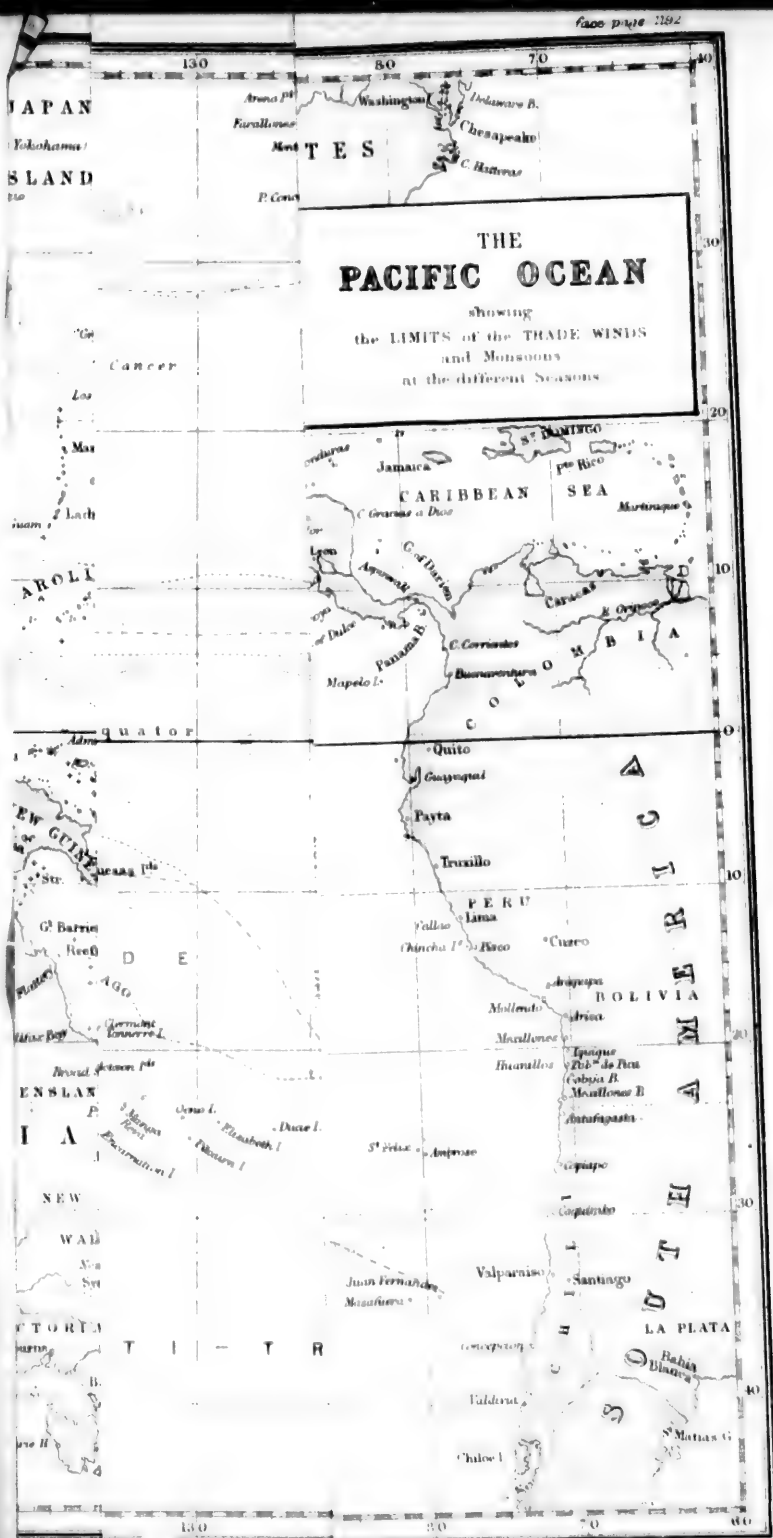
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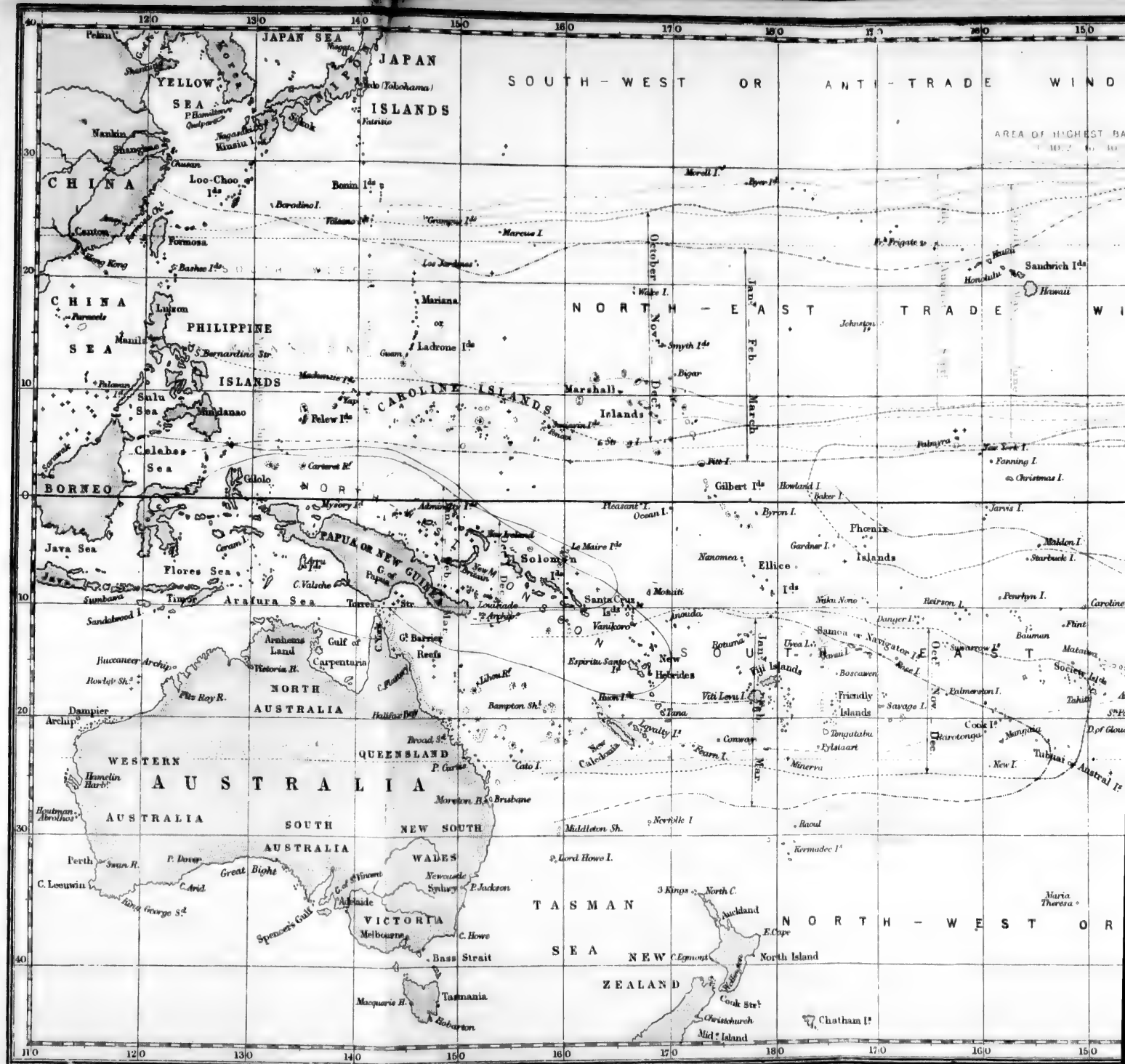
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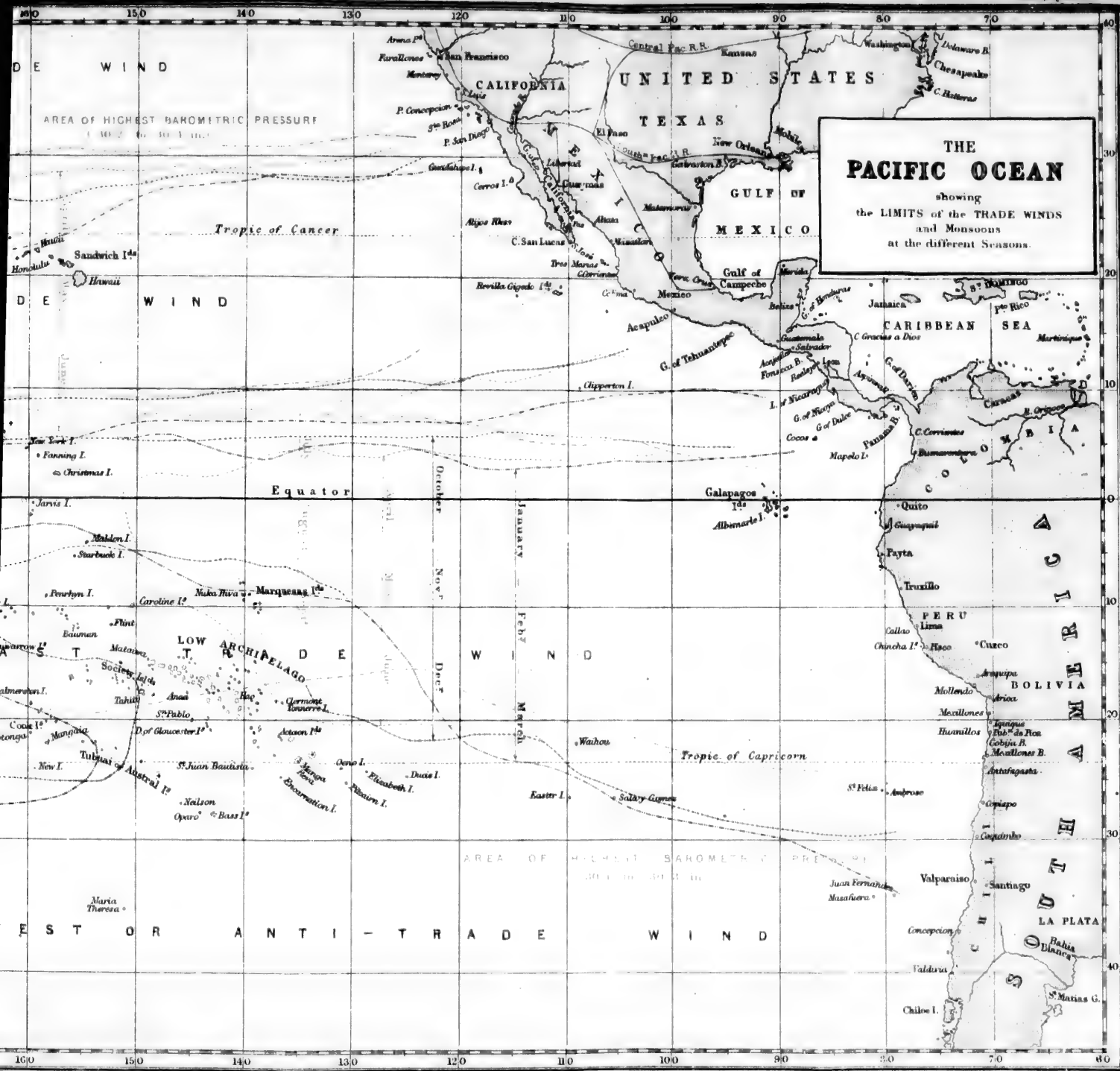
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6½ hours it sank as low as 719·8 (28·35 in.), or 1·53 inch in 18 hours, and rose again in the next 9 hours almost to its normal height. In that time and in the three following days over 15 inches of rain fell.—*Professor J. J. Rein.*

In the tropics, where the barometer varies so slightly under ordinary circumstances that any fall greater than ·35 in. is a sure sign of an atmospheric disturbance, the prognostics of a typhoon are evident; but in more temperate latitudes, where the barometer varies considerably with no apparent atmospheric change, the prognostics are less certain. In Japan, the barometer during September and October varies between 29·9 and 30·0; but when it remains very steady, with an increase of oppressive heat above the mean temperature, and when this is accompanied by a threatening aspect of the sky, a misty halo round the sun or moon, lurid clouds tufted in shape, a heavy bank of leaden-coloured clouds in the horizon, lightning, and frequently a long, heavy, ocean swell, then a typhoon may be confidently expected.

We may here make mention of a valuable and interesting Paper, illustrated with charts, by Mr. H. Harries, of the Meteorological Office, read before a meeting of the Royal Meteorological Society, November 18th, 1885. Mr. Harries there traced the course of a typhoon (which originated in about lat. 13° 30' N., long. 134° E., September 27th, 1882) across the North Pacific Ocean and the continent of North America, whence it proceeded over the North Atlantic Ocean, arriving on the western coast of Europe on October 27th, and thence passed away to the West coast of Norway and the Baltic Sea, completing its course of about 14,000 nautic miles in 36 days, or at an average rate of 16 miles per hour. The observations on this typhoon show that the size of these meteors is sometimes considerably greater than various writers have supposed it to be, as in the early stage of its existence the disturbance extended on the N.W. side to a distance of 1,300 miles from its centre.

Proceeding slowly at first, on arriving at lat. 20° N., long. 130° E., this typhoon began to quicken its pace, and passed along the S.E. coast of Japan at the rate of about 33 miles an hour, the barometer here reaching its lowest point, 28·7. On passing away from Japan to the N.E., between October 2nd and 3rd, it reached a speed of 51 miles an hour; it then decreased in speed towards the Peninsula of Alaska, after passing which it again increased till it struck the coast of Vancouver Island on October 10th, thus crossing the Pacific at an average speed of 17 miles per hour. Its track across the ocean is shown on the diagram facing page 1165.

As a guide to mariners, Mr. Harries pointed out that a rising barometer, accompanied by an increase of easterly wind, seemed to indicate the formation of a storm to South and East of an observer in the neighbourhood of the northern edge of the tropics.

CHAPTER XVI.

THE CURRENTS OF THE NORTH PACIFIC OCEAN.

We have in many places in the other volumes of this series described the general system of ocean currents, and the causes which set them in motion, so far as is known, so that little need be said here on the subject.

"Varying in volume and velocity until they attain the proportions of gigantic rivers flowing (in some parts) at the rate of several miles an hour, the currents occupy every part of the ocean, no part of which can be said to be in a condition of absolute rest. Combined together they form, like the currents in the atmosphere, a complete system of circulation, by which the physical and chemical equilibrium of the ocean is maintained. From the principal storehouse of heat in the tropics, warm currents proceed towards the temperate and frigid zones, and return thence in the character of cold currents towards the regions of the Equator.

"Two currents of different origin, and therefore of different temperature, weight, and chemical composition, meeting, may present as solid an obstacle to the progress of each other as if they were barriers of rock, and one is compelled either to alter its direction, or to flow above or below."—*Mr. J. J. Wild.*

The North Pacific is the most simple in the arrangement of its currents. It is a basin of circulation, around a central area lying along the tropic, analogous to the Sargasso Sea in the North Atlantic, and having the same feature of a broad equatorial stream setting westward, with more or less constancy, between 8° or 10° N. and the tropic, a reverting and strongly marked current, the Japanese Current, similar to the Gulf Stream, and a broad extra-tropical belt setting generally eastward, but subject to much fluctuation.

But the North Pacific differs from the North Atlantic in not encountering any Arctic influences. Behring Strait is too narrow and shallow to allow either the waters of the Pacific to flow into the Arctic basin, as is the case with the warmer waters along the western coast of Europe, or to permit the ice-bearing streams from the polar basin to flow down to the Pacific, as does the Labrador Current. These varied changes are almost inappreciable here.

As stated in a former page (1166), the area of the Pacific is so great that the forces which act upon the waters of the smaller oceans, the Atlantic and Indian

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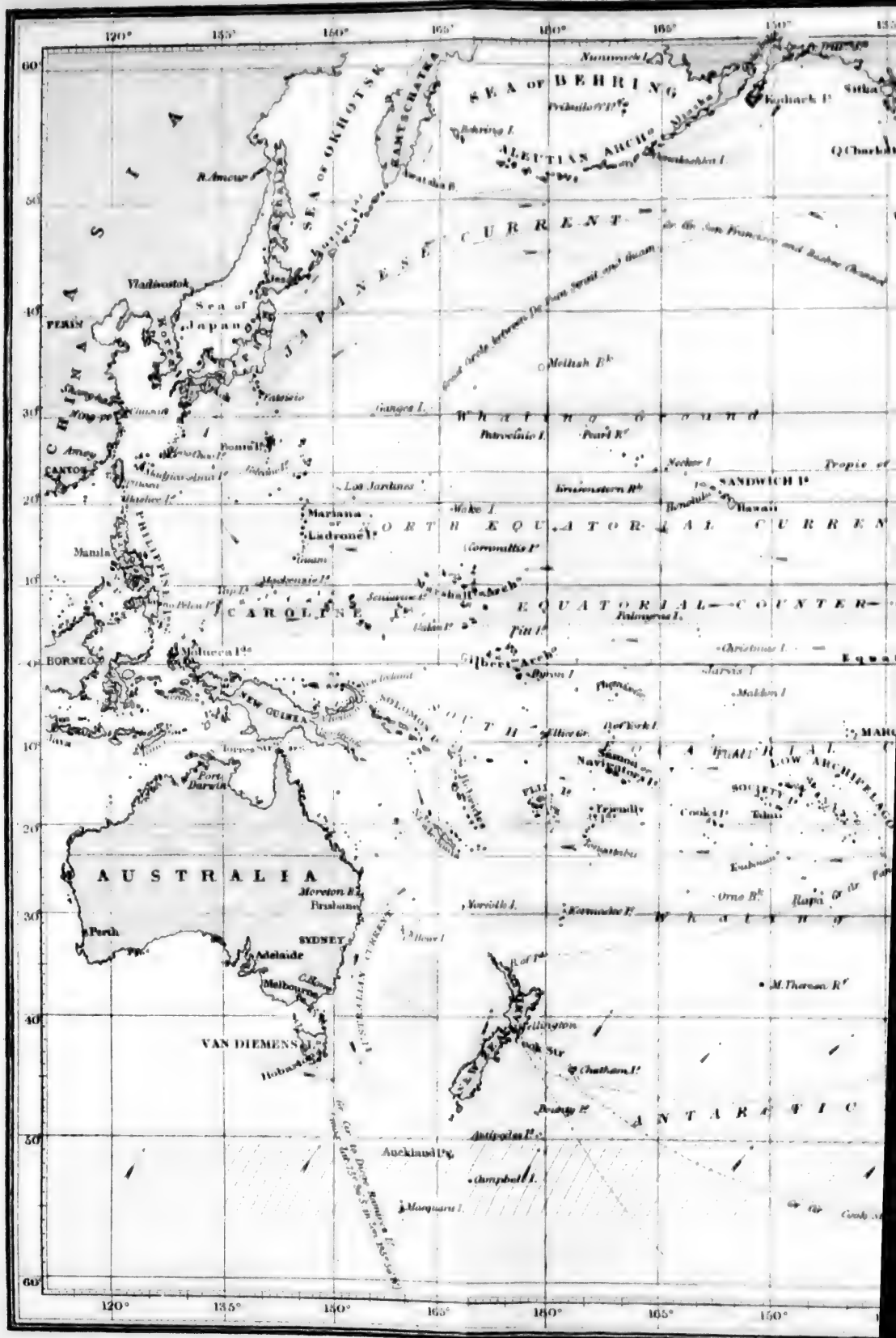
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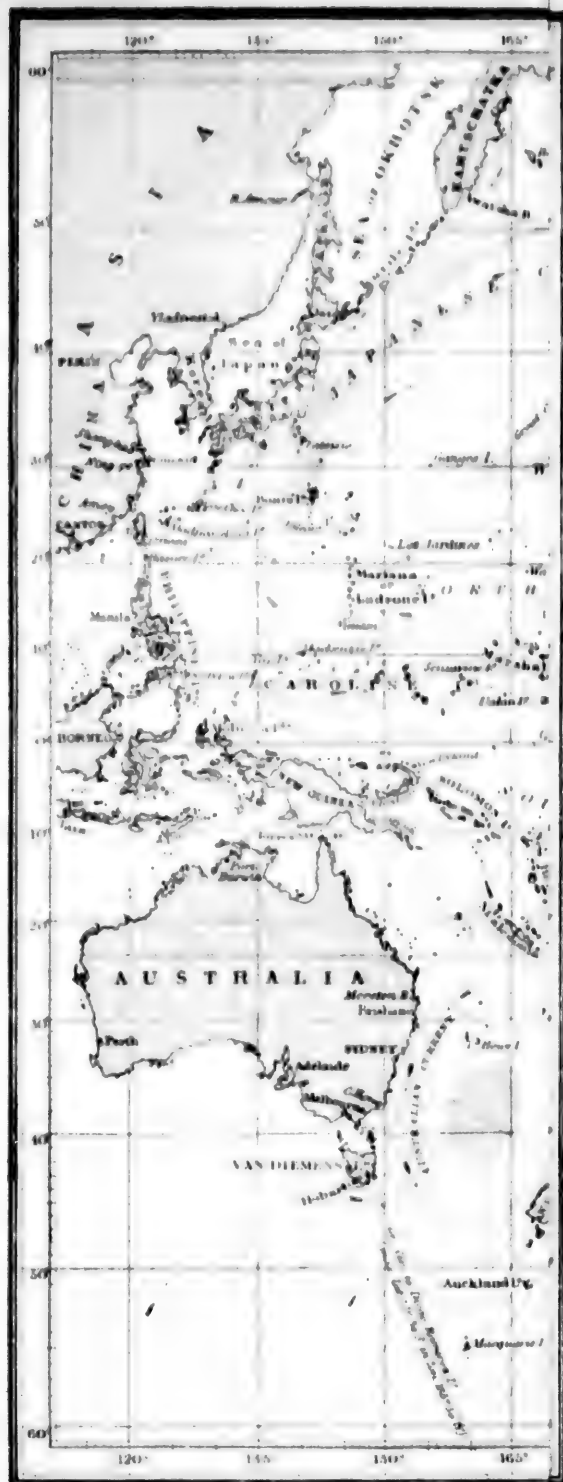
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Oceans, exert a much more marked effect on them than they do on the currents of the Pacific. It is the same with the winds, and thus its meteorology exhibits but few of those grander features which may be found elsewhere, and pre-eminently characterise it as the "Pacific" Ocean.

On this account the ocean currents are of less importance to the navigator except in a few regions, such as near the Equator, the Gulf of Panama, the coast of Mexico, or southward and eastward of Japan. Elsewhere they seem to exert no very definite influence on a ship's course.

THE NORTH EQUATORIAL CURRENT.

The North Equatorial Current, extending to the mean latitude of 24° N., is subject to the variations experienced in the southern portion of this extensive drift.

In its eastern portion there is no well-marked origin, as is the case in the Peruvian Current flowing to the N.W. and westward at the Galapagos Islands. On the contrary, as elsewhere remarked, the Mexican coast currents are comparatively weak and undecided, so that there is *some* source from whence the westward tendency of the ocean is derived, beyond the apparent effects of the trade wind and the action of the sun's heat.

Whether it be the effect of heat, or from the continued action of the trade winds, one fact seems to be tolerably well determined, and that is, in the circulation of the oceanic waters around their respective basins, the greatest velocity or force of the currents is at their *outer* limits; this force gradually diminishes within the area, and leaves a space not acted on by the circulatory movement, and which area, by analogy, we should expect to find of a higher temperature than might be calculated on if the polar streams should not add their lowering influence. Following this theory we must expect to find them in greater force nearer the Equator, a fact apparently established. And in the central portion of the North Pacific there does not appear to be any regularity in the set of the waters, and the limit before assigned may even be too high, as the Sandwich Islands, in lat. 20° , do not appear to be surrounded by any permanent current.

The following remarks by Captain Wilkes is confirmatory of this:—"After passing the parallel of 10° N. we began to feel the effects of the current that is ascribed to the influence of the trade winds, and this continued without much diminution of strength until we lost the trades in lat. 19° N. The drift of this current was 271 miles in a direction S. 71° W."—Vol. v., p. 476.

Capt. Wilkes continues:—"At the Sandwich Islands I am not disposed to think, from any observations I had an opportunity of making, that there are any regular currents, or any set of the waters, except what is caused by the winds. There is, in fact, rarely any difficulty in beating to windward; the

time of passing between the islands is about the same at all seasons of the year; and I found none in beating up to my port in any reasonable time after falling to leeward of it. Their position is assimilated to St. Helena. The temperature of the waters around these islands is about the same as that which prevails in the ocean in the neighbourhood, a fact which I consider to be a proof that no polar current reaches them." The circumstance of pine timber being drifted on to the East end of Kauai, as noticed on page 1100, would almost prove, beyond a doubt, that the currents were, at times, to the S.E. from the coast of America, where the timber apparently came from; but another circumstance, equally conclusive in an opposite direction, is the drift of a Japanese junk, as related presently.

On the passage of H.M.S. *Challenger* from Honolulu to Tahiti, in September, 1875, very strong currents were experienced. The North Equatorial Current extended to 11° N. (the southern limit), its general direction being S. 60° W., 18 miles per day, and its temperature varying from 77° to 79° .—*Staff-Comm. T. H. Tizard.*

Our observations on the set of the waters to the West of this, between lat. 10° and 20° N., need be but few. That westerly currents are those prevalent is undoubted; but their northern limits, or velocity and regularity, do not appear to be well known.

Kotzebue, when he first saw the Marshall Islands in 1817, intended to have examined them, but he was drifted through them by so strong a current to the West, that he could not recover his position.

The currents at the Marianas are also subject to great variations (see page 1040). Capt. Golownin met with a rapid current, bearing to the N.E., though the wind blew from that quarter, and a Spanish officer affirms that a similar current generally flows at this part. It is probable that the westerly monsoon, which is felt at the Marianas, from the middle of June to the middle of October, according to Freycinet, may cause a reversion of the usual current.

Captain Marchand, in *La Solide*, when to the eastward of Tinian, in long. $148^{\circ} 14'$ to $148^{\circ} 34'$, calculated that he had been set 41.6 miles to the eastward in 48 hours; this was on November 2—4, 1791.—*Fleurieu's Voyage of Marchand*, vol. ii., p. 420.

The American Expedition found the currents strong to the northward and westward, to the N.E. of the Mariana Islands.—*Voi. v.*, p. 268.

The parallel of 30° N. is a favourite one with the whalers, as Capt. Beechey states (vol. i., p. 236), and it is hereabout that we might look for that line of demarcation which separates the easterly and north-easterly drift of the ocean waters, occasioned by the trade winds. According to Capt. Wilkes, great quantities of *jonthina*, the soft mollusc which serves as food for the whale, were found on the verge of the trade, in lat. 26° N., long. 168° W., the trade having failed a degree to the southward. Again, when the Expedition was in about

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lat. 30° N., long. 180°, vast quantities of *anatis*, another mollusc, were found to lie in a W.S.W. and E.N.E. direction.—Vol. v., p. 109.

This arrangement of their locality would certainly appear to indicate some combined influence of current. The temperature of the adjacent water is not stated, but it is probable that some variation would have been found to the northward and southward of this line of zoophytes. We have not materials wherewith to pursue this subject further; nor have we any distinct notion of the set of the currents, if any, to the westward of the Marianas. But it is certain that the Equatorial Current reappears in the form of a warm N.E. current to the South of the Japanese Archipelago, the progress of which will be presently traced.

THE EQUATORIAL COUNTER-CURRENT.

In our general remarks on the winds, on page 1168, it is said that in the aerial systems of the Pacific, as elsewhere, there was a space between the two great belts called the N.E. and S.E. trade winds, in which the wind was variable and light, and in which calms and rains prevailed. This zone of variable winds, as they are known, is affected, in their breadth and latitude, by the annual progress of the sun in the ecliptic.

In the current systems we have a precisely analogous phenomenon—that of a body of water moving with more or less regularity to the eastward, bounded to the North and South by currents moving in the opposite direction. This counter-current has been traced, with considerable certainty, nearly across the entire breadth of the Pacific: and the ensuing extracts will explain its character. The first are the observations made by Captain Lütke, in his traverse in the *Sénigavine*.

After crossing the parallel of 30°, in long. 81°, we had for 48 hours, and during light winds and calms, a weak current between North and N.W.; and then for a fortnight, from lat. 28° S., and long. 116°, that is for a space of 2,400 Italian miles, we scarcely felt any current at all. In lat. 26° we had a S.E. wind, which passed insensibly to the condition of a true trade wind, and which even sometimes blew freshly, but all this did not produce any current; during two or three different days we had a weak current to the West, following the wind, and for as many days returning against the wind. In the course of this fortnight the difference between the estimated longitude and that by the chronometer did not exceed 20', and there was none in latitude.

Between lat. 10° and 2° S. there was for four days, during which the trade wind, without blowing strongly, was constant and equal, a tolerably strong westerly current, the mean velocity of which, to W. by N., was 17 miles in 24 hours.

In lat. 2° S. the trade wind left us, and the current shifted also to the East,

then to N.E., and again to S.E., but more to this last quarter as far as lat. 8° or 10° N., where the N.E. trade stopped it. The mean effect of this current was E. 6° S., $12\frac{1}{2}$ miles in 24 hours.

For the sixteen days that the current just spoken of lasted, there were but two which showed any exception, but to compensate they were very striking; this was between lat. 1° and 4° N., where the currents drifted us, in 48 hours, 75 miles directly to the N.W., in extremely light airs between East and S.E., and sometimes during almost an entire calm.

This easterly current could here be attributed to light variable winds coming from the western quarter, but the same thing occurred in the neighbourhood of the Caroline Islands, when the N.E. trade wind blew constantly, and sometimes with considerable strength. In approaching the island of *Ualan* we found a S.E. current, in lat. 8° , and long. 163° E. To the West of this meridian the easterly current did not extend toward the North beyond the parallel of 7° , and toward the South, in general, beyond that of $5\frac{1}{2}^{\circ}$. Between these parallels, and as far as long. 152° E., in the course of more than three weeks (in January), we did not once have westerly currents, but always to the East, inclining to the South in the eastern moiety of this space, and more to the North in the western half. There was no exception to this order, except between the *Séniavine* Islands, where the neighbourhood of coasts and the action of the tides might easily interrupt the regularity of the usual currents. Its mean effect, during these three weeks, was 8.3 miles in the 24 hours to the E. by N.

We had no sooner passed to the North of the parallel of $6\frac{1}{2}^{\circ}$, in long. 152° E., than we got into a strong current to the West, which did not leave us afterwards. To the West of 152° E. we only got once to the South of the parallel of 7° (from the 9th to the 12th of April, in long. 144° E.), and we also found the current inclining to the East. To the South of the parallel of 5° , on the meridian of the island of *Ualan*, the current bore chiefly to S.W., but then, once, in lat. 3° , the current was to the East, 13 miles in 24 hours.

A zone of easterly currents, between the constant westerly currents, as well in the western as in the eastern part of the Pacific, has also been noticed by other navigators. Captains Hunter and Wilson found it more to the South than we did, in the limits of the Caroline Archipelago. Capt. Duperrey, between lat. 2° and 6° N., and 7° to 10° E. of *Ualan*, had currents to the S.E. and N.E., but on approaching this last island they were still more to the S.W.; again, between the Equator and $8\frac{1}{2}^{\circ}$ N., and long. 148° E. and 137° E., he again found the easterly currents. Admiral Krusenstern places the limits of this East current, meridionally, at the Equator, and the parallel of 6° ; from our experience these limits are 5° and 7° , although in long. 163° E. we had already met with them. Capt. Freycinet found strong East currents between the latitudes of $9^{\circ} 20'$ and 4° N., and long. 149° and 144° W. Capt. Beechey, in his route from the Society Islands to the Sandwich Islands, found between the Equator and 4° N., where he got into the N.E. trade wind, a N.N.E. current,

the mean activity of which was 18 miles in 24 hours. Captain Wendt, in the Prussian merchant-ship *Princesse Louise*, found in three different years, between the parallels of $6^{\circ} 30'$ N. and $10^{\circ} 30'$ N., and long. 125° and 131° W., currents from the N.E. quarter, of a velocity of from 17 to 25 miles. From all appearances, these easterly currents have some connection with each other; but we do not yet possess a sufficiently large number of facts from which to deduce a general view of the subject.

To the North of this eastern current, within the limits of the easterly winds, we also found a constant current to the West, inclining in some parts towards the North, in others to the South. Between the parallels of 7° and 9° , where we passed at different times more than a month, the currents constantly bore away between W.S.W. and W. by S. In the months of February and March, between long. 152° and 146° , their mean force was, in 11 days, of 15 miles in 24 hours, to S. 83° W.; between long. 147° and 144° , in the same interval of time, of 8 miles to S. 71° W. In November and December, between long. 156° and 140° , in 16 days, of 14.4 miles in 24 hours, to S. 79° W. Farther on, towards the West, in our route to the China Sea, we experienced nearly the same currents, their direction and force being in general 16 miles in 24 hours, to S. 70° W.

To the North of lat. 9° the currents inclined more to the West of North. In the eastern half of the Pacific (between long. 130° and 146° , from lat. 10° to 30°) we found their general direction to be N. 86° W., and their force 11.7 miles in 24 hours. In the western half, on our route to the island of Guahan, their general direction, in the interval of 4 days, was found to be N. 75° W., 22 miles in 24 hours; and on our return from the Caroline Archipelago, under the same apparent circumstances, and in the same interval, S. 49° W., 22 miles in 24 hours. In leaving the Carolines in April, as far as lat. 22° , where the trade winds left us (from long. 143° to 139° E.), we had constant westerly currents, the general action of which, in 10 days, was N. 52° W., 18.3 miles in 24 hours; and in returning from the North to this archipelago in November, we had these N.W. currents for the greater part of the time, up to the period of our meeting with the trade winds, in lat. 26° (long. 199° to 204°); and we found their mean rate, in 9 days, to be 14.7 miles in 24 hours, to N. 69° W. On the meridian of the island of Ualan, on the contrary, as far as the parallel of 28° , also in November, the general direction of the current was S. 43° W., 18 miles in 24 hours.

We did not observe that the direction or strength of the trade winds determined the direction of the current to the North or South of West. These different inclinations occurred with winds perfectly the same; we must, therefore, rather seek the reason in some local circumstances if they should not proceed from some general and permanent cause, and are not an accidental phenomenon, changing without order.

A correspondent of the "Nautical Magazine" (January, 1843,) also speaks

of this reverse current:—In July, 1833, on the Equator, in long. 175° E., a current of about 2 or 3 knots an hour ran to the eastward for 14 or 15 days, although the wind was then fresh from the eastward; and it was thought that such changes have generally occurred once a year, probably induced by a strong S.W. or westerly monsoon in North latitude, reaching at this time near the line. They are fitful changes, and not to be depended on, nor can their extent to the eastward be stated.

Capt. Wilkes says:—"On our route to the northward we crossed a stream setting to the westward, which extends as far westward as the Kingsmill group, between lat. 2° S. and 3° N., after which we encountered another, setting with equal velocity to the East, between lat. 4° and 9° N. This last tropical counter-current was traced by us between the same parallels nearly across the Pacific, from the long. of 170° E. to the long. of 138° W. We had no opportunity of ascertaining ourselves whether it exists to the westward of the Mulgrave Islands. But Horsburgh, and several other authorities, mention the prevalence of an easterly current as far to the West as the Sea of Celebes, and particularly in lat. 4° N."—Vol. v., p. 476.

At the Gilbert Archipelago, during violent gales from S.W., which prevail from October to April, trunks of large trees are thrown upon the West sides of the islands, together with large lumps of resin, similar to that found in the soil of New Zealand.

During the passage of the U.S. ship *Narragansett*, August, 1872, from the Gilbert to the Marshall Islands, the wind was generally E.N.E., with pleasant weather; between the parallels of 3° and 5° N., the current ran North, 18 miles in 24 hours; between 5° and $6^{\circ} 30'$ N., the current was N. 54° E., 17 miles; from $6^{\circ} 30'$ to $7^{\circ} 0'$, N. 24° W., 6 miles; the Equatorial Counter-current being distinctly marked.

Between Byron Island and Apaiang a westerly current of 25 to 50 miles per day was experienced.

On the passage between the Marshall and Gilbert Islands an easterly current of about 1 mile an hour was experienced until between Matthew Island and Apaiang, where a strong westerly current of nearly 3 miles an hour was suddenly found. A current running 2 miles an hour to the westward was generally found near the Gilbert Islands.—Capt. Simpson, H.M.S. *Blanche*, 1872.

In June, the current, which was westerly in the southern part of the Gilbert group, began to set to the northward and eastward, North of Apamama. Off the North point of Maraki the current was observed to be running to the eastward at the rate of three-quarters of a mile an hour. Among the Marshall Islands easterly currents of less than 1 mile an hour were experienced. Rainy weather, light variable winds with easterly in them, and, as a rule, moderate easterly currents were experienced between the Marshall and Caroline Islands.—H.M.S. *Espiegle*, 1883.

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Further particulars of the currents in the neighbourhood of these groups of islands will be found in Chapter XII.

Captain Bristow found the current strong from West to East at the Purdy Islets, in February and March, 1817.

On the passage of H.M.S. *Challenger* from the Admiralty Islands to Japan, in March, 1875, the currents in the immediate neighbourhood of the Admiralty group, and as far North as the 5th parallel of North latitude, were very strong, running to the westward at rates varying from 14 to 37 miles per day. Between the 5th and 10th parallels little or no current was experienced, but from thence to the 19th parallel, where the trade wind was lost, an average set of 17 miles per day was experienced, the direction varying from N.W. to W.S.W. From the 19th parallel the currents were variable until the Japan Stream was entered.*

On her passage from Honolulu to Tahiti, in September, 1875, from 11° N. to 6° N., the Counter Equatorial Current was found running to the eastward at an average rate of 30 miles per day, but its force in 7° N. was 50 miles per day, and its temperature varied from 80° to 82°.

From 5° N. to 5° S. the *South Equatorial Current* was running to the westward at an average rate of 43 miles per day, but in 1° N. its speed was no less than 70 miles. Its temperature varied from 77° to 79°, being 77° at its axis of greatest rapidity. This extraordinary rate was also experienced in the French corvette *L'Eurydice*, in August, 1857, in 3° 50' N. We also found this current setting to the westward, just North of the Admiralty Islands, in March, 1875, with an average rate of 30 miles per day, but its temperature then was from 83° to 84°. From 5° S. to Tahiti the currents were to the southward, about 12 miles per day.—*Staff-Commander T. H. Tizard.*

The following remarks on the counter-current are by Admiral Krusenstern:—

"This current, bearing from West to East, forms to the North of the Equator a zone which extends to the 6th degree of latitude, and the velocity of which is frequently 20 leagues in the 24 hours. Ships returning from China during the season of the S.W. monsoon, and proceeding by the Pacific Ocean towards the Strait of Ganem (Dampier Strait), do not generally go farther towards the East than the Pelew Islands; but if they do not pay great attention to this current, they will usually be carried several degrees towards the East. The best means of avoiding this stream of current is to attempt to cross it as quickly as possible from North to South, because South of the Equator the S.E. trade is met with, accompanied by a current bearing to the West, the rate of which, near the coast of New Guinea, is from 15 to 40 miles in the 24 hours, in a West and W.N.W. directions."

* Report of the Scientific Results of the Exploring Voyage of H.M.S. *Challenger*, 1873—1876, Narrative, vol. i.

Sir Edward Belcher inferred the existence of this easterly current on approaching Clipperton Island, which is in lat. $10^{\circ} 17' N.$, long. $109^{\circ} 13' W.$ He says:—"No living trees were seen, but the whole island was covered with gannet, boobies, frigate pelicans, and several kinds of tern, which had also been noticed in great numbers during the previous week, at least 500 miles to the eastward. From this an easterly current may be inferred, as these birds generally keep in its stream or tail course."

Vancouver found a strong current ($2\frac{1}{2}$ knots) setting to the eastward and N.E. when off Cocos Island, as mentioned hereafter.

These observations will demonstrate that between lat. 4° and $10^{\circ} N.$, which limits may be subject to some fluctuation, there is a current running to the eastward, or against the usual course of the inter-tropical winds and the drift of the ocean on either side of it, and extending from the western extremity of the Pacific as far as long. $115^{\circ} W.$, and perhaps beyond this, if the Peruvian cold current should not extend beyond that latitude in this meridian.

"A more simple explanation of this counter-current may be found in the fact that the Equatorial Currents, as they flow on each side of the belt of calms, remove the water from the eastern and accumulate it at the western side of the basin, and that the counter-current tends to restore the equilibrium thus constantly disturbed."*

In the Nautical Magazine, April, 1880, pp. 276-286, is a letter from Capt. J. McKirdy, of the SS. *Peruvia*, detailing his experiences in several voyages between Honolulu and Callao, in the year 1878. In leaving Honolulu for the eastward he met with strong northerly and westerly currents, where he expected to have found the Equatorial Counter-current; by taking advantage of these, on his return voyage, he made several good runs of 314 to 332 miles per day. He concludes that the southerly current along the West coast of North America, when met by the Peruvian Current, is forced to the westward, and, meeting the counter-current, turns away to the northward at a point varying with the strength of the latter, and then bears off to the westward again. Its approximate track, as given by Captain McKirdy, is shown on the chart illustrating the currents, at the commencement of this work.

Capt. McKirdy states the colour of this current is of a deep blue colour, its temperature being about 78° , and that of the surrounding water of the North Pacific, which is of a beautiful bright blue colour, 2° higher; the cold Peruvian Current is of a dark dirty green colour. He thinks its breadth, when it runs swiftly, is 80 or 100 miles, and great care is necessary, if taking advantage of it, not to run out of it. The thermometer will give the first warning of getting into or out of it.

* "Thalassa: An Essay on the Depth, Temperature, and Currents of the Ocean," 1877; by J. J. Wild, on the scientific staff of H.M.S. *Challenger*.

THE KURO SIWO, OR JAPANESE CURRENT.

As before stated, the movements of the waters, as well as of the atmosphere, seem to be on a more limited scale, and less decidedly marked, in the northern Pacific than they are in the southern hemisphere. This is probably owing to its comparatively enclosed character. From this cause it deserves, in some degree, the title of Pacific, and its navigation is not attended with any difficulty, as any ordinary ship may, with perseverance, work to windward in its central portion.

But towards its western side the movement of the ocean becomes manifest, and we find a great analogy in this respect to that of the North Atlantic, and, accordingly, a very distinctly characterized current in the Pacific follows a parallel course to that of the Gulf Stream, well known in the Atlantic.

From the different configuration of the land, however, the absence of any western barrier, such as the Mexican coast presents to the western progress of the Atlantic waters, and the contraction of its channel by the Bahama Islands, this Pacific Gulf Stream has not such a distinct character as is seen in the Gulf of Florida. Still this warm ocean river may be traced in its course by observation and analogy around the northern side of the North Pacific.

This current, in the earlier part of its course, was noticed by several navigators, especially Captains King, Krusenstern, and Broughton, whose remarks will be given presently.

The first point which may be noticed in it is the authority of the Japanese charts. On all of them, as shown by Von Siebold and Krusenstern, between Fatsizio and the Mokiera Islands, that is, off the S.E. part of Nipon, South of Yedo, a current to the eastward is marked, called the *Kuro Siwo Stream*, or, as Krusenstern calls it, *Kouroseyawa*, or the *Current of the Black Gulf*. The latter adds this remark:—"This current is 20 matsi (five-ninths of a Japanese ri, that is, about three-quarters of a mile), or 15 miles broad. For 10 matsi it has a very rapid course. In winter and spring it is very difficult to navigate, but in summer and autumn vessels can pass it."

Capt. Gore, after the deaths of Captains Cook and Clerke, returned from the northward in the *Resolution*, making the coast of Japan in the beginning of November, 1779. Capt. King states that, in this passage, when they approached the S.E. part of Japan, they were drifted by a strong current from the S.W., and that when they reached the latitude of $35^{\circ} 43'$, in eight hours, instead of making a course of 9 leagues to the S.W., they had been carried 8 leagues from the position they had left in a diametrically opposite direction, giving a velocity and direction to the current of at least *four miles* an hour to the N.E. by N., the longitude being $141^{\circ} 16'$. Capt. King makes the following comments on this:—"As the strong currents which set along the eastern coast of Japan may be of dangerous consequence to the navigator who is not aware

of their extraordinary rapidity, I shall take leave of this island with a summary account of their force and direction, as observed from the 1st to the 8th of November. On the 1st, when we were about 18 leagues to the eastward of White Point (lat. $35^{\circ} 24'$), the current set N.E. by N., at the rate of 3 miles an hour; on the 2nd, as we approached the shore, we found it continuing in the same direction, but increased in its rapidity to 5 miles an hour; as we left the shore it again became more moderate, and inclined to the eastward; on the 3rd, at the distance of 60 leagues, it set to the E.N.E., 3 miles an hour; on the 4th and 5th, it turned to the southward, and at 120 leagues from the land its direction was S.E., and its rate not more than $1\frac{1}{2}$ mile an hour; on the 6th and 7th it again shifted round to the N.E., its force gradually diminishing till the 8th, when we could no longer perceive any at all. This calculation would make it about 250 miles broad off this part of the Japanese coast.

The next authority we shall quote for it is Admiral Krusenstern, who passed to the eastward of the islands, September, 1804. From the introductory portion of his great work we extract the following:—

The currents constantly run to the N.E. From the Strait of Sangar (Tsugar), as far as the parallel of $36\frac{1}{2}^{\circ}$, we had daily a current, which carried us N.E. $\frac{1}{2}$ E. at the rate of 10 miles in the 24 hours. From the latitude of 36° to $35\frac{1}{2}^{\circ}$, being about 70 leagues from land, it bore towards the E.N.E., with a velocity of 2 miles an hour. From the parallel of $35\frac{1}{2}^{\circ}$ to $34\frac{1}{2}^{\circ}$ the current bore to N.E. $\frac{1}{2}$ N., $1\frac{1}{2}$ mile an hour; we were then 60 leagues from land. Traversing the islands lying to the South of the Gulf of Yedo, we felt a current bearing to S.W., with a velocity of nearly a mile an hour; but after having passed these islands some degrees to the West, we again met with the former current bearing to the N.E.

When we discovered the coast of Japan upon the parallel of 31° , and particularly the southern part of the Isle Sikokf, the current carried us to the N.E., $3\frac{1}{2}$ miles an hour. Capt. Broughton ranged near the eastern coast of Japan during the months of November and July. We see by his journal that he felt a current which carried him to the N.E., at 2 miles an hour, with this difference, nevertheless, that during the month of November the current bore more toward the North, and in July more to the East, but always between these two directions. We can conclude from the foregoing, that the currents upon the eastern coast of Japan are subjected to fixed laws, at least during the months of July, September, and October, and that their strength and force depend on the distance where they are met with from the coast.

It would be easy to multiply evidence of its character, but we take the description given of it in Commodore Perry's account of his mission to Japan, by Capt. Silas Bent, as derived from the investigations by the U.S. officers in 1854 (pp. 601—603).

It is an immense oceanic current on the East coast of Asia, which bears a striking analogy, in every essential point, to the Gulf Stream of the Atlantic.

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The results of these observations show quite conclusively that the stream has its origin in the great Equatorial Current of the Pacific, from which it is separated by the South end of Formosa, about the latitude of 22° N., long. 122° E., whence it is deflected to the northward along the East coast of Formosa, until reaching the parallel of 60° N., when it bears off to the northward and eastward, washing the whole S.E. coast of Japan as far as the Straits of Sangar (Tsugar).

Near its origin the stream is contracted, and is usually confined between the islands of Formosa and Majico-sima, with a width of 100 miles, but to the northward of the latter it rapidly expands on its southern limit, and reaches the Lew-Chew and Bonin groups, attaining a width to the northward of the latter of 500 miles.

The north-western edge of the stream is strongly marked by a sudden thermal change in the water, of from 10° to 20° , but the southern and eastern limit is less distinctly defined, there being a gradual thermal approximation of the air and water.

Along the borders of the stream where it chafes against the counter-currents and torpid waters of the ocean, as also in its midst, where ~~whirls~~ and eddies are produced by islands and the inequalities in its bed, strong tide-rips are encountered, often resembling heavy breakers on reefs or shoals. Its average velocity, between the South end of Formosa and the Straits of Sangar, was found to be from 35 to 40 miles per 24 hours. Yet, upon one occasion, off the Gulf of Yedo, its maximum strength is recorded as high as 80 miles per day.

To the northward of the parallel of 40° N., in long. 143° E., there is a cold counter-current intervening between it and the South coast of Yesso, as shown by a sudden thermal change in the water, of from 16° to 20° , which, it is believed, sets to the westward, through the Straits of Sangar, but the limited stay of the squadron in that vicinity, and the harassing prevalence of fogs, prevented such observations being made as to satisfactorily determine whether or not there was a predominant current flowing in either direction, or whether it was merely the ebb and flow of the tides through the straits. To the westward, however, of a line connecting the North end of Formosa and the south-western extremity of Japan, a cold counter-current was again found, which sets to the southward through the Formosa Channel into the China Sea, and it does not, therefore, seem unreasonable to believe that a hyperborean current will be found in the Japan Sea, setting to the southward between the Japanese Islands and the main coast of Asia, fed by that on the South coast of Yesso, and supplying that one setting through the Formosa Channel.

The average maximum temperature of the Kuro-Siwo is 86° , and the difference between its temperature and that of the ocean due to the latitude is about 12° . There was no counter-current intervening between the Kuro-Siwo and the coast of Japan, to the southward of the Straits of Sangar, and nothing was found to manifest the existence of such a current as *underrunning* that stream, and

although the observations indicate strata of cool water lying in the longitudinal direction of the Kuro-Siwo, yet their temperature varied but a few degrees from the main body of the stream, and was almost invariably superior to that of the atmosphere above them. The insular position of Japan, and the separation of the cold counter-current from the Kuro-Siwo, allowing the latter to hug close along the south-eastern shores of the islands, have a modifying influence upon the climate of the empire, making it milder and more equable than in corresponding latitudes on the East coast of the United States. There is a floating sea-weed found in the Kuro-Siwo, similar in appearance to the *Fucus natans* of the Gulf Stream.

In the passage of the *Mississippi* from Simoda to the Sandwich Islands the thermometer showed a cold aqueous space between the meridians of 155° E. and 170° W. and the parallels of 30° and 35° N., which bears a general correspondence in the Pacific to the position of the Sargasso Sea in the Atlantic.

The stream being interfered with and checked in its northern course by the coast of Japan is not only driven off and forced to the eastward with great speed, but is very erratic in its movements. I have heard of vessels being carried dead to windward against a heavy gale at a wonderful speed; other ships, thinking themselves close off the coast, suddenly finding they were far away to the South, being carried hither and thither amongst the islands and rocks. The Japanese have erected excellent lighthouses along their coasts, and, of course, the navigation of these formerly dangerous seas has now become simple enough, and the current so much dreaded before is made of the greatest service in running along the coast.—*Capt. H. C. St. John*, H.M.S. *Sylvia*.

The recent investigations of the *Tuscarora* and *Challenger* prove that this current follows the axis of the 4,000-fathoms depression existing eastward of Japan, and, on its northern margin, bands of the cold Arctic water have been found in it. The warm water may be followed to a depth of 500 fathoms, but at all depths it remains about 4° or 5° of temperature under that of the Gulf Stream in the same latitude and depth. As it runs northward it decreases in depth, speed, and temperature, but notably increases in breadth.

This current is, however, much influenced, both in direction and velocity, by local causes. It is sometimes* entirely checked for a day by a N.E. wind; when it may be again expected to resume its former course, and possibly run with greater rapidity than usual for one or two days. On one occasion, off the Gulf of Yedo, its maximum strength is recorded as high as 72, 74, and 80 miles respectively, on three successive days.† But at other times some observations

* But not always: H.M.S. *Centaur*, in August, 1861, having been drifted 53 miles in 24 hours, in the face of a strong E.N.E. gale, between 136° and 137° E.

† The current seems to attain its greatest velocity between Van Diemen Strait and the Gulf of Yedo, but was recorded on one occasion as only 24 to 27 miles on three successive

have shown results greatly at variance with the generally received accounts of it. Its average velocity between the South end of Formosa and Tsugar Strait has been found to be from 35 to 40 miles in 24 hours.

A strong south-westerly current has been experienced southward of the Loo-Choo and Meiacosima Islands, where the Kuro Siwo would be expected to be met with. It was noticed about the end of September, 1879, or at the change of the monsoons from S.W. to N.E. Captain G. Scott, of the British ship *Lucile*, writes to us as follows:—"I have to bring to your notice a strong south-westerly current 30 miles South of Loo-Choo Islands and Meiacosima group, setting with a velocity of 48 miles per day, and appearing to take the sweep of those islands at that distance, viz., 30 miles. I experienced it for five days in trying to get to the eastward, and finally had to put back and go North through the passage between Kumi and Ku Kien San, where I found the Japanese Current setting N.E., 40 or 50 miles a day."

Staff-Commander T. H. Tizard, H.M.S. *Challenger*, makes the following remarks on the Kuro Siwo:—"Our observations show that when we approached Japan from the southward, in April, 1875, we passed through a belt of water running to the north-eastward at the rate of 3 miles an hour, between lat. $32^{\circ} 30'$ and $33^{\circ} 30' N.$, in long. $138^{\circ} 15' E.$ On the southern edge of this belt the stream had a more northerly, and on its northern edge a more easterly tendency than N.E. When to the northward of this rapidly-moving belt of water, a set of 1 mile an hour to the eastward was experienced. When in the stream the temperature varied from 63° to 68° , changing suddenly, giving alternate bands of cold and warm water without our being able to detect any alteration in its rapidity.

In May we had a moderate set to the eastward close to the South coast of Nipon Island. In June we had no current at 30 to 40 miles from that coast, but south-eastward of Nipon found a stream of 72.5 mean temperature running 2 miles an hour to the northward. This rapid stream of alternate belts of warm and cold water probably originates in the following manner:—

During the N.E. monsoon a cold surface-current runs southward from the Japan and Yellow Seas. It appears, therefore, highly probable that instead of losing itself, as is supposed, it meets the warm Equatorial Current, when the two divert to the eastward, and run together side by side without intermingling their waters. When the N.E. monsoon ceases this cold current also ceases, which causes the slackness of the Kuro Siwo, South of Nipon Island, in June, as it is then only due to the Equatorial Current. Later on, in July and August,

days. It is sometimes deflected to the South by the chain of islands South of the Gulf, or before reaching them. Changes in the stream are probably dependent on the seasons.

* Full particulars of the meteorological and other observations made on board H.M.S. *Challenger* will be found in the "Reports on Ocean Soundings and Temperatures," 7 Nos., folio, published by the Admiralty; also in the Narrative of the voyage.

when it is augmented by the surface-drift from the China Sea in the S.W. monsoon, it runs again with great rapidity, and is wholly a warm current. These peculiar effects are probably not experienced to the eastward of 140° E.; there, apparently, the stream is always a warm one.

On June 16 the temperature in Yedo Bay was 65° ; off No sima Head it rose to 69° , and gradually to 72° . Eastward of Japan, in lat. $35^{\circ} 30'$ N., long. $163^{\circ} 39'$ E., the surface temperature decreased to 64° , or 5° below the water on either side, and the water to the depth of 1,000 fathoms was similarly affected. This remarkable decrease of temperature is probably owing to a southerly current from the Sea of Okhotsk or the western part of Behring Sea, as Commander Belknap, U.S. ship *Tuscarora*, found a cold belt of water opposite the entrance of these seas, and this must extend to the 35th parallel, where it nearly ceases, as the cold belt was very narrow, only extending over a distance of 20 miles, East and West.

After passing the North extremity of Formosa, on the way from Hong Kong to Yokohama, the Kuro Siwo is soon entered. A striking restless movement of the water, and an appreciable increase of temperature, 7° to 18° , make the transition obvious. Under a cloudy sky its colour is gray, in sunshine deep blue. According to observations on board the P. and O. steamer *Avoca*, in late summer the water here reaches 80° , only 5° below the highest temperature of the Gulf Stream.—*Professor J. J. Rein.*

The counter-stream to the Kuro Siwo flows from the North; part reaches the Sea of Japan, and meets the Kuro Siwo somewhere about the Korean Straits. In this neighbourhood I have seen the meeting of these two streams, which is most remarkable, the one so dark and deeply blue, the other of a pale green colour. They do not mix, but rub against each other. So decided is this that on taking the temperature, almost on either side of the ship, the difference was 14° .—*Capt. H. C. John.*

The Kuro Siwo sets through Van Diemen Strait at from 1 to 5 knots an hour, the maximum velocity occurring while the ebb stream is running (by the shore) at spring tides; the current decreasing in strength as the coast of Kiusiu is approached.*

Thus far the definition of the Japanese Current rests on positive evidence of unexceptionable character, as far as regards the seasons in which they were made. But its effects may be traced to the northward and westward.

It reaches the coast of Kamchatka. The mildness of the climate about Awatska Bay is attributed to the warm (Japanese) current coming from the

* We cannot here enter into the scientific discussions of numerous authorities on this important current. In 1878, Professor T. Antisell read a valuable Paper, "On the Temperatures of the Pacific Ocean," before the Philosophical Society of Washington, U.S., and in the U.S. Coast Survey Report, 1880, will be found a description of the Kuro Siwo, by Mr. W. H. Dall, in connection with the Currents of Behring Sea, and founded on Professor Antisell's observations.

south-westward, and thus ameliorating the severity of the winter. The comparative freedom from ice of the bays and inlets is also another evidence of its influence. The universal fogs which prevail, too, in the vicinity of the islands in the western portion of the Sea of Behring, arising, most probably, from the difference of temperature between the air and water, also indicate the same fact, and are analogous to the same phenomenon on the banks of Newfoundland, arising from the Gulf Stream.

The destruction of a Japanese junk occurred near the South end of the Kamchatka Peninsula in July, 1729. It was proceeding to Oosaka, in the South of Japan, and was drifted away by a violent storm to the N.E., and at last reached the place alluded to. This is also corroborative.

Another similar circumstance is that of a Japanese junk which had drifted from its destination, and anchored, in December, 1832, at Oahu, Sandwich Islands. Although the currents in the vicinity of this group do not seem to be very well defined in their character, this circumstance must also be considered as an evidence of the easterly drift from Japan.

But we may look still further to the East. A Japanese junk was wrecked near Cape Flattery, in Oregon, in 1833. This last is detailed by Washington Irving, in his "Astoria." These singular occurrences at once attest the tendency of the currents, and open a wide field for discussion on the migration of the inhabitants of eastern Asia and the peopling of the western world.

As an intermediate point where we may look for indirect evidence of the progress of this stream, the South extremity of Kodiak Island may be adduced. Here the remains of Japanese wrecks, recognised by the camphor-wood used in them, and other Japanese articles are found. Thus it appears to trend to the eastward towards the coast of N.W. America, and then assume a more southerly direction. This theory is confirmed by the ensuing remarks of Commander Wilkes, of the United States' Exploring Expedition:—Our passage from the Hawaiian group to the N.W. coast gave interesting results in relation to the currents. They were irregular until we reached the latitude of 27° N., after which we were strongly affected by a S.E. current, whose influence continued until we reached the coast of Oregon. At this time it ran at the rate of 50 miles in 24 hours; but when the *Peacock* traversed this same space, 90 days later, the velocity had not only diminished, but what current was found was nearly in an opposite direction. In relation to the extent of this S.E. current in the months of March and April, I have no precise information, nor can I supply it from others, since those who had previously visited this part of the ocean had not paid sufficient attention to this subject to furnish any precise data. All, however, agree in the fact, that they were affected by a S.E. current, often reaching the longitude of 130° W. and the latitude of 35° N.

Admiral Lütke, whose scientific character and ample means command all confidence, makes the following observations on this part of the ocean.

North Pacific.

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In the same way that the constant West current within the limit of the N.E. trade winds is explained by the constant easterly winds, so beyond this limit we meet with such currents as the prevalent wind would afford an explanation. We met with but one exception to this rule. In the three traverses to the South of Kamchatka and back again, between lat. 30° and 40° to 45° , and long. 162° and 146° , we found, even with easterly winds, currents to the East. In our route from the Bonin-sima Islands to Kamchatka, in May, 1828, we felt the first effect of this current, in lat. $33^{\circ} 42'$, where in two days it carried us 74 miles to the N.E., in calms and extremely light S.E. winds. From thence, in lat. 45° , we had for ten days, with only two exceptions, always currents to the East, although during all this time the wind was between S.E. and N.E., and that they blew sometimes very freshly. The mean action in this interval was 15 miles in 24 hours to N. 47° E. The current after that bore even more to S.E., but then during fresh winds from N.W. In the route from Kamchatka to Ulan, in October and November, we found the first S.E. current in lat. 38° during S.E. winds; the currents towards the East quarter kept up for 8 days, the strongest occurred this time, too, in about lat. 34° , when we were drifted, in 24 hours, 35 miles N. 5° E., the wind nearly calm. Its mean action in these 8 days was 8.6 miles in 24 hours, to the E.S.E. We found it in the same manner, and a year later, in lat. 40° , during a strong S.E. wind, or S.E. current. It was not then so marked, but as far as lat. 31° its general direction was towards the N.E. quarter, and afterwards, in lat. $27\frac{1}{2}^{\circ}$, we again found the S.E. current, two consecutive days, of 10 miles in 24 hours, with the weather nearly calm, or extremely light East winds.

Captain Beechey found the same during 3 days, in about lat. 35° N., long. 166° E.; the currents were then from 40 miles to the S.E. to 6 miles to the South, and 19 miles to S.E. by S.

These currents have a remarkable analogy with those which have been observed in the same latitude on the coast of Japan, where strong East and N.E. currents predominate. In comparing these phenomena with each other, the conviction cannot be avoided that some connection exists between them.

This is the only current in the northern part of the Pacific Ocean in which any sort of constancy has been observed independent of the prevalent winds; with the exception of this, we usually found that the currents followed the prevailing wind. To the North of this parallel of 42° , in the western part of the sea, we chanced to have the wind almost always from the East, and with it currents to the West, which, during fresh breezes, were sometimes of 20 miles per day, and when it fell calm they ceased entirely. In some cases, on the contrary, when the winds passed to N.W., the current then turned to S.E.; the immediate influence of the wind was here evident. The same may be affirmed for the space comprised between the parallels of 30° and 32° and the limits of the N.E. trade wind, although we have met with some exceptions. In our route from the Caroline Archipelago to the Bonin-sima Islands we lost

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the trade wind in lat. 22°, and thence to lat. 27° we had constantly currents to the North, which corresponded more with the direction of the wind than with its strength, they being sometimes very strong with very light airs. Their mean action in the interval of 6 days was 15·3 miles in 24 hours, to N. 9° E. To the North of the Bonin-sima Islands, until we got into the N.E. current above described, we had westerly currents of the mean rate of 12 miles in 24 hours, with the winds fresh from East. Farther to the eastward, on the corresponding parallels, the currents were also to S.W., with westerly winds.

In the eastern part of the ocean, on our route to the N.W. part of America, the easterly winds accompanied us, from lat. 30° to lat. 45°, with such constancy that we could not observe any change from the trade to the variable winds. Farther on, until we reached within sight of the land, the East winds still continued, but they were neither so fresh nor so steady as before. During the whole of this time the current was sometimes N.W., at others S.W., varying in strength from 5 to 15 miles, its mean velocity in the space of 15 days being 8·6 miles per day to S. 87° W.

On leaving the N.W. coast of America we likewise experienced a S.W. current, but then it was more decided. In the first 4 days, up to lat. 54°, long. 142°, it carried us to S.S.W. at the rate of 10 miles per day, even with winds from the West; it was only arrested once by a very strong wind from S.W. Farther on, on our route to Ounalashka, during which contrary winds obliged us to bear to the South, as far as lat. 48½°, we did not have, in the course of 11 days, up to lat. 52°, long. 160°, any sort of current; thence to Ounalashka there was a weak current between N.W. and S.W. Its mean drift in 24 hours was, in 4 days, 6 miles S. 76° W.

The currents experienced by us do not at all correspond with those observed by the Russian colonial marine, who found the motion of the water, driven by the almost continual West and S.W. winds, in general follows the direction of the coasts, in running to the North as far as Cook's Inlet, or Kenaiskoi Bay, and from thence to the S.W. Between the N.W. coast of America and the meridian of Kodiak the latitude observed is always greater than that by the reckoning, and quite the contrary farther towards Ounalashka. Articles that have been dropped or been thrown overboard from vessels at 100 miles to the S.W. of Sitka have been found in Prince William's Sound, or Tchougatskoi Bay: this shows, also, that the currents run to the North or N.E., and from this arises the great quantity of débris, of every description, thrown on shore in the neighbourhood of this bay. The current to the S.W. and S.S.W. along the Strait of Chelckhoff and the South coast of Alaska, as well as on the South coast of Kodiak, is confirmed by the inhabitants of this latter island, who search for, and always find, the wounded whales that have been abandoned, in the direction of Oukamok Island, where they are carried by the drift of the current. The strength of the southerly current, at 150 miles to the South of Kodiak, has been sometimes found to be 60 miles in 24 hours. This southerly current

is sometimes met with at 3° to the East of the meridian of Kodiak, and extends to the passages between the Aleutian Islands, in which there are also periodic currents to the North, stronger than the opposing currents to the South. It is remarked, in general, that in spring and autumn the current is more strong and constant than in the other seasons; this, perhaps, explains why we did not find them in the order described.—*Voyage du Sniavine*.

Mr. W. H. Dall makes the following observations on the latter current:—The great Pacific Gulf Stream sends a branch northward and westward from the vicinity of lat. 50° N. on the N.W. coast of America along the coast. This current, with a temperature of 50° to 55° , during part of its course at least, seems well defined, and has been termed in my reports the *Alaska Current*. The great rainfall and generally mild temperatures of the shores of the Gulf of Alaska seem to be almost wholly due to its effects.

At some indeterminate point this current divides into two branches, running about a knot an hour, one of which passes between Kadiak and the mainland, hugging the coast, and finally striking off to the southward in the vicinity of the Shumagins. The other has a more evenly western course, and its extreme southern limit is yet undefined, but may probably be found between lat. 51° and 52° N. Between these two arms a counter-current or eddy exists, running in an easterly direction. The North arm may be assumed to average about 100 miles in width; the South arm is probably twice as great.

In addition to the foregoing there will be found, on pages 782 and 916—917 *ante*, some further remarks on the great Japan Stream.

The *Oya Siwo*, a counter-current of cold water, sets to the southward along the S.E. coast of Kamchatka and the Kurile Islands, and, flowing along the East coast of Yezo and the N.E. coast of Nipon, is felt as far South as Inubo-ye saki. It has an average breadth of 200 miles, but varies in velocity and extent in the different seasons, being much stronger in the winter than in the summer. Except between the Kurile Islands, through the straits, and past Cape Noyshaf, its velocity is about 18 miles a day; through these narrows, however, it sweeps occasionally with great speed, particularly during or after a strong north-easterly wind. Its temperature varies, according to the season, from 10° to 15° lower than that of the Kuro Siwo. The average temperature of this current in May was 37° (10° below that of the surrounding atmosphere). In July the temperature was observed to be 66° at between 10 and 30 miles from the shore; farther off shore where the temperature rose to 70° , or where it bordered on the Kamchatka Current flowing to the northward, the current is not perceptible. The *Oya Siwo* is not felt close to the shore of Nipon, along which the tidal streams are well defined.

The *Kamchatka Current* is a branch of the Kuro Siwo, from which it separates in the parallel of 40° N. on the meridian of 150° E., and flows at an average rate of 18 miles a day, with a breadth of about 200 miles, to the north-

eastward as far as 51° N., where it deflects to the eastward towards the Aleutian Islands.

SEA OF JAPAN.

There exists at present but little information regarding the navigation of the Sea of Japan. The winds there appear very variable, and the currents, depending on special causes, are at times insignificant, whilst at others they run with great strength. The only thing known with certainty is, that a branch of the Japan Stream, as a rule (although with many variations of velocity, direction, and breadth, and much influenced by the wind), holds its way north-eastward from Korea Strait, at a rate of 2 to $2\frac{1}{2}$ knots an hour as far as the parallel of 38° N., northward of which it generally gradually lessens in force. At the Strait of Tsugar it splits into two streams, one branch setting to the eastward through the strait with great velocity; the other branch continues, but with greatly diminished strength, along the West coast of Yezo, and flows into the Sea of Okhotsk through the Strait of La Pérouse. This current attains its greatest force during the S.W. monsoon, slackening and becoming variable at the change of the monsoons in April and October, and setting to the southward in winter, in the season of northerly and westerly winds in the Sea of Japan, and of the N.E. monsoon in the China Sea.

Between Vladivostok and the S.W. part of Yezo elevations of temperature of 10° to 14° , at all times of the year, closely indicate the transition from the cold coast-current into the Tsushima (or warm) current.—*Professor J. J. Rein.*

There seems to be no regularity in the currents along the western coast of this sea; they are in general very feeble, increasing only off the abrupt points of the coast. Broughton, who, in October, 1797, passed close along this coast, notices a current setting to the S.S.W. at the rate of 1 mile an hour. The French frigate *Virginie*, in July, 1856, found weak currents setting to the northward at a mean rate of 10 miles in 24 hours. In summer a stream has been found setting to the S.W. along the coast of Manchuria.

In the *Gulf of Tartary* there is scarcely any current, it being subjected to tidal influence. The great body of water flowing into it from the Amur River causes a general set to the southward in the middle of the gulf, but it is scarcely perceptible South of the parallel of 50° ; with strong northerly winds, however, it is materially increased, but with winds from the southward it is not appreciable.

SEA OF OKHOTSK.

The direction of the currents in this sea is somewhat uncertain; they are found to increase in strength as the land is approached.

Near Cape Elizabeth, and on approaching the Gulf of Amur, heavy overfalls and ripples occur, which appear to be produced by shallow surface-currents, and they often render a vessel quite unmanageable. On some occa-

sions, in a steady 5-knot breeze, vessels have been for hours with their head in the wrong direction, unable to answer the helm or trim of sails. A strong surface-current here may naturally be expected, as the immense body of water from the Amur, meeting with the obstruction caused by Saghalin Island, effects its escape by the largest outlet, rushing over the shallow banks at the mouth of the river, and, continuing its course, following the line of coast round Cape Elizabeth, causes, especially with East and S.E. winds, a dangerous race, extending off shore 3 or 4 miles, and setting strong to the southward along the eastern coast of Saghalin, where, for some distance, the sea is discoloured by it.

The *Kurile Current** has its source in the deep bays of Ghijinsk and Penjinsk, and runs along the West coast of Kamchatka towards the Kuriles, which it washes in their whole length after receiving a weaker current from the East side of the peninsula near Cape Lopatka. Then it washes the North and East of Yezo, and has here, even in the height of summer, a very low temperature of but 39° . Finally on the eastern shores of Nipon, in lat. 39° , this arctic current is reduced in summer to a narrow strip of a coast-current, while in winter it penetrates 1° farther South. This cold current is called by the Japanese *Oya Sineo*. It has a dark troubled colour, contrasting strikingly with the dark blue water of the warm current.—*Professor J. J. Rein*.

SEA OF BEHRING.

The Kamchatka Current, a branch of the Japanese Current, and the general drift induced by the prevailing S.W. winds, enters the Sea of Behring from the S.S.W., and exerts considerable influence on the climates of the respective shores. But in a nautical sense they are unimportant. The following is an extract from Mr. Simpson's remarks, drawn up while in H.M.S. *Plover*, in 1852:—In the absence of actual observations for determining the currents in these seas, the proofs of the existence of such a one as that described are collected from other circumstances, the chief of which are as follow:—

In the beginning of summer the eastern side, South of the strait, is free from ice, and Norton Bay itself is usually cleared as early as April. After the middle of June not a particle of ice is to be seen between Point Spencer and King Island, whilst the comparatively still water North of St. Lawrence Island is hampered with large floes until late in July. This can be satisfactorily accounted for by the existence of a northerly current of warmer water, partly driving and partly thawing the ice from the American shores.

* So named by Dr. L. van Schrenck in an article entitled "Des Courants dans la Mer d'Okhotsk," from observations recorded on Russian vessels, published in the "Mémoires de l'Académie impériale de St. Petersburg," 1873, and re-published in the "Hydrographische Mittheilungen," 1874, and in the "Annales Hydrographiques," 1876.

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There is scarcely a particle of drift-wood to be had on the Asiatic coast from Kamchatka to East Cape, whilst abundance is to be found in Port Clarence and Kotzebue Sound, as well as along the whole of the American shore from Norton Bay to Point Barrow. Although it has been found that pine trees 60 inches in girth grow here, on the banks of American rivers, within the 67th parallel of latitude, yet from the frequently larger size of the trunks, and their great abundance, it is evident these northern regions, including Norton Bay, cannot supply the quantity; and more southern rivers, whether Asiatic or American, or both, must be looked to for the immense multitude of water-worn stems and roots strewed almost everywhere along the beach. Their southern origin would also seem to be indicated by the presence, in many of them, of the remains of the *teredo navalis*, which could hardly retain life throughout the rigour of eight or nine months frost every year. Capt. Wellesley mentions having picked up, on the North side of the entrance to Port Clarence, a buoy which had been previously lost from the anchor of the *Dadalus* off the island of St. Lawrence.

In the United States Coast Survey Reports, 1872 and 1880, and in the Appendix i. to the Pacific Coast Pilot, are some elaborate Reports, by Mr. W. H. Dall, on the Currents and Temperatures of Behring Sea and adjacent waters, and on the Meteorology of Alaska, from which the following extracts are taken:—

Along the coast of Eastern Siberia, from East Cape to Cape Lopatka and south-westward, a flow of cold water steadily pours from the N.E. It is probably quite narrow in Bering Strait, but spreads out as it passes south-westward, and between Kamchatka and the western end of the Aleutians occupies a width of 600 or 700 miles, consisting of a thin surface-stratum, which has in July a temperature but little over 40° F., beneath which is a thin band varying from 35° to 40° (both together not exceeding 50 fathoms in vertical extent), while beneath this to 3,700 fathoms the mass of water varies from the freezing point to 35°.

My own conclusion, from a study of the data, is that the general tendency of Bering Sea is to the southward, and where deep enough, as in the western part of the sea, it forms a tolerably well-defined current (which I shall call the Kamchatka Current, though this is not the Kamchatka Current of most hydrographers, which forms only a very small part of the one under consideration), whose character and motion are probably very constant. While a certain amount of water enters Bering Sea through Bering Strait, under favourable circumstances, this amount is relatively insignificant, and the Kamchatka Current can hardly be properly termed a polar current. It is a current proper to the cold deep basin of that part of Bering Sea West of the shoal waters, and to a great extent reinforced by precipitation and the river supply from the two continents. There is not a particle of evidence to show that any mass of warm

water constituting a warm current is given off in the direction of Bering Sea by the Kuro Siwo.

The chief current of the Bering Sea is a motion of cold water southward. This has a superficial stratum above it, which has, in summer when not interrupted by winds, a northerly motion of translation, but is not sufficient to be entitled to take rank as an ocean current.

The surface currents of Behring Sea are formed by, or chiefly dependent on, tides, winds, river flows, the southerly motion of cold water, the distribution of floating ice, and the northerly motion of slightly warmer surface water, which are effective in about the order named.

No warm current from Bering Sea enters Bering Strait, with the exception of water from the adjacent rivers or sounds. This water owes its heat directly to the local action of the sun's rays.

N.W. COAST OF AMERICA.

The great extra-tropical drift has been traced in its eastern progress, from the imperfect data at our command, in the previous pages. Like the currents on the coast of Europe, the warmer waters are driven on to this coast, and so cause all the peculiarities of water and land climates alluded to on page 592. The sea abounds with animal life to an enormous extent. It is the greatest fishery in the world, while the S.W. winds, blowing on to the coast over the water warmer than is due to the latitude of the coasts, deposit on the land the accumulated evaporation, and cause the climate of Alaska to be among the wettest in the world.

The Alaska Current, a branch of this drift, sets to the northward of lat. 50° along the coast, and southward of this parallel the main body appears to turn to the S.E. and South.

COAST OF CALIFORNIA.

The drift we have been tracing, in a reverse direction to the geographical arrangement of this work, assumes a more decided character along the coast of California, and is here much colder than the corresponding latitude, so that the harbours, such as San Francisco, are frequently enveloped in fogs. It follows the general trend of the coast, and may be 300 miles broad in the more marked portions of its course, but this is very indefinite. Under the shelter of the projecting headlands, and frequently close in-shore, there are counter-currents, and reversed tides, by which small vessels can advantageously work their way against its general influence. Its velocity is 14 or 15 miles a day, reaching a maximum of 22 miles off the entrance to the Gulf of California.

On approaching the southern parts of California, and in the latitudes of the

peninsula, it assumes a higher temperature and a more westerly course, and is gradually merged in the great equatorial drift first described.

WEST COAST OF MEXICO.

The currents on this debateable ground are very difficult of definition. The navigation of sailing vessels is frequently very difficult and tedious, owing to the embarrassment of calms and varying drifts, but there is no doubt they fluctuate with the shifting monsoons which prevail here. Cape Corrientes, in lat. $20^{\circ} 25'$, that is fairly within the tropic, and which is subject to the varying streams which give it the name, is probably the northern limit of these shifting streams, and between that and Cocos Island, around which the streams are very devious, it may be considered that the general set will be to the southward, between S.E. and E.S.E., in the winter months, and northward, N.W. to W.N.W., the rest of the year, but, as before stated, nothing very definite can be laid down. It appears to have a breadth of nearly 360 miles, and there is a counter-current close in-shore.

The central portion of the North Pacific appears to be devoid of any currents dependent on any primary cause; and around this space the currents circulate in the order which has been described.

In the *Physikalischer Atlas*, by Professor Berghaus, a space in the eastern part of this area in the North Pacific is called *Fleurieu's Whirlpool*, as it is translated in the British edition of that work. This vortex is assumed from the reasoning by Fleurieu on the voyage of *La Solide* by Etienne Marchand. But independent of the not very satisfactory conclusions arrived at by the geographer, in the Appendix to the second volume of that work, it may very fairly be questioned whether the reckoning of the vessel is entitled to such dependence as to found any characteristic of the currents as is attempted in the chart alluded to. It was stated in the outset that the estimation of currents was no easy problem, and that many causes concurred in the error of a ship's reckoning which have been unjustly attributed to the effects of currents. This argument will probably apply with some weight to the voyage in question.

There can be no doubt that this so-called vortex is but the eastern extremity of that central area of quiescent waters around which the eastern and western drifts of the Pacific basin circulate. There is one most remarkable evidence of this in the growth and abundance of animal life, aerial and marine, which everywhere is found. Sea-fowl, of many species, hover constantly over it; the waters are alive in some parts with mollusca and the fish which feed on them, and for many years it was one of the favourite whaling grounds of the

North Pacific.

- Pacific fleet, their prey being attracted here by the abundance of food. In this respect it is precisely a repetition of the well-known Sargasso Sea in the Atlantic.
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We have thus briefly and imperfectly drawn attention to the more marked features of the movements of the Pacific waters, which are, as said before, somewhat difficult to define.

The notes by Commander Trollope, R.N., given in the Appendix to the Voyage of H.M.S. *Herald*, will be of great interest, as showing the uncertain nature of the currents in the S.E. part of the North Pacific.

CHAPTER XVII.

I.—TIDES, MAGNETISM, ICE.

1. TIDES OF THE NORTH PACIFIC OCEAN.

EXCEPT on the surrounding shores, where they exhibit similar phenomena and magnitude to other parts of the world, the tides of the Pacific are insignificant, and almost unnoticeable to the mariner. The tables which are given hereafter contain the elements of the tides necessary to navigation: that is, the hour of high water, and the rise and fall of the tide, on the coasts of America, Asia, &c. But in the vast space between these two boundaries the tidal wave is scarcely appreciable, except by refined observation, and can form but a small portion of the actuating consideration in navigation.

Under these circumstances we deem it unnecessary to enter into the general laws of the tides as founded by the illustrious Newton, or the interesting features elicited by the discussion of the late Rev. Professor Whewell and Sir John Lubbock. The present consideration, therefore, will be confined to the general view of the Pacific tides, as set forth by Dr. Whewell, to whom the main features of the tidal laws, as they are now known, is mainly owing.

THE REV. W. HEWELL ON THE TIDES OF THE PACIFIC.

I shall not attempt to determine the general course of the tides in the Pacific, but will remark that the view now given of the distribution of the tides in an ocean explains several of the features of the Pacific tides, which were before very perplexing. If we suppose an ocean tide, from the borders of which proceed tides having their progress marked by cotidal lines, we can easily draw the lines so as to include the following facts and observations:—

1. The *easterly* motion of the tide wave around Cape Horn, which is established by Capt. King's observations, and which is difficult to reconcile with the supposition of a tide revolving from West to East round the South pole. This is explained by its being a tide proceeding from an oceanic tide.

2. The tide being at nearly the same hour along a large portion of the coast of South America, namely, from the Strait of Magalhaens for 20° or 30° northward. This shows that the cotidal line is nearly parallel with the shore.

3. The very small tides, or no tides, at the islands in the centre of the Pacific, Tahiti, and the Sandwich Islands. These belong to a central portion of the ocean, where the rise and fall of the surface nearly vanishes.

There are two sources of inaccuracy in tide observations, namely, the want

of a clear understanding as to the thing to be observed, and the irregularity and complexity of the facts themselves. With regard to the former point, I hope that several misapprehensions, formerly prevalent among navigators, are now no longer common; such as confounding the time of high water with the time of the turn of the tide stream. But there is probably still some unnecessary difficulty produced by regarding, as a cardinal point in observation, the "establishment," as vulgarly understood, namely, the hour of high water on the day of new or full moon; for, in fact, the hour of high water on this day is of no more importance than the hour of high water on any other day, except in so far as it gives the means of knowing the hour on other days. And it does not afford the means of doing this any more than the hour of high water for any other given age of the moon does. For just as much inaccuracy as, from whatever cause, there is in deducing the time of high water at all ages of the moon from the time at a given age, just as much inaccuracy is there, from the same causes, in deducing the time of high water for all ages of the moon from the time for full or new moon. And if the time at which the tide follows the moon on two or three successive occasions be greatly and irregularly different, the observations are equally of little value, whether any of the observed tides fall on the day of the new or full moon, or do not.

If the tides are regular, and the observations good, the common "establishment" may be obtained from the observations of any one day; although, to give it much value, the tides should be observed for a fortnight. And if such observations be made for a number of very distant places, the common "establishment" does not represent a corresponding fact at different places. In some places it means the time of high water one day after the highest tide; in some, the tide two days after the highest tide; in some, three days; for the "age of the tide" is different at different places, and the tide which corresponds to the new or full moon comes after the new or full moon by one, two, or three days. Hence, in order that we might compare the tides of distant places by means of a fact which had the same meaning in all of them, I proposed, in a former essay, instead of taking this common establishment, to take what I then called the *corrected establishment*, namely, the *mean* of all the lunital intervals, that is, of the intervals by which the tide follows the moon's transit. In general, the corrected establishment is about thirty minutes less than the common establishment. It has been used by Admiral Lütke, in his discussion of the tides of the Pacific. As the common establishment is still the one familiar to navigators, and as no material error will result from the use of it, I shall make it the basis of my remarks on the tides of the Pacific. It may be useful to bear in mind what I have said, that this establishment may be deduced from observations not made at the new or full moon.*

* I have here said that in cases where the tides follow the common laws we may deduce the time of high water on one day from the time on another. I might have said the same thing of the heights.

I shall now proceed to give the tide hours for the coasts of the Pacific, according to the best accounts which I find, judging them in the manner I have described. After noticing the course of the tide near Cape Horn, I shall follow it along the whole western coast of America, till, in the North, we reach the Aleutian Islands; and then, following this chain of islands, to the shores of Kamtschatka. I shall then consider the islands in the central parts of the Pacific, and proceed from them westward, according to my materials.

WEST COAST OF NORTH AMERICA.

	Lat. North.	Long West.	Time H. W.	Greenw Time.	Rise.	Authority.
		H. M.	H. M.	H. M.	FEET.	
Galapagos, Charles Id.	1 15 S.	6 2	2 10	8 12	..	FitsRoy, p. 84.
Cocos	5 34	5 15	2 10	7 35	..	Purdy, E. M., p. 50, Vancouver.
Panama	8 57	....	3 20	....	..	Lloyd, Phil. Trans., 1830.
Panama Bay .....	....	5 18	4 0	....	13	Kellett
" .....	....	....	3 36	8 54	15	Sir E. Belcher.
Ni oya .....	....	....	....	8 0	..	FitsRoy.
Island S. Lucas	9 56	5 42	3 0	8 42	6	Sir E. Belcher.
Realejo	12 28	5 48	3 0	8 48	6	Sir E. Belcher. Great irregularities.
Acapulco	16 50	6 39	2 41	9 20	1	Sir E. Belcher.
" .....	....	....	3 5	9 44	2	Du Petit Thouars.
Magdalena Bay	24 38	7 28	8 30	....	6	Sir E. Belcher. Very anomalous.
" .....	....	....	7 37	3 5	6	Du Petit Thouars.
San Blas	21 32	7 1	8 5	3 6	..	Mem. on S. America.
" .....	....	....	....	3 0	..	FitsRoy.
" .....	....	....	9 41	4 42	..	Beechey.
Mazatlan	23 0	7 10	9 50	5 0	..	Beechey.
Monterey	36 36	8 6	9 42	5 48	..	Beechey.
" .....	....	....	9 52	....	7	Du Petit Thouars.
San Francisco	37 48	8 9	12 30	....	6	Sir E. Belcher. Very anomalous.
" .....	....	....	10 52	....	..	Diurnal inequality, H. W. & L. W. large in ht. and times.
" .....	....	....	10 33	6 42	6	Beechey & Malaspina.
Port Bodega	38 19	8 11	11 41	7 52	..	Russian nav. (Lütke's notice).
Columbia River	46 16	8 16	1 0	9 16	8	Russian navigators.
" .....	....	....	1 30	....	..	Sir E. Belcher.
Straits of Juan de Fuca	48 0	....	12 30	....	8	Vancouver.
Nootka Sound	49 36	9 2	10 40	....	12	Kellett.
" .....	....	....	12 33	9 35	12	Sir E. Belcher. Great diurnal inequalities.
F. Nicolaefsky (Cook's Inlet)	60 15	10 6	3 49	1 55	28	Lütke
						Wrangell.

From this point the coast turns westward, and the stations are arranged according to longitude, without regard to their latitude.

	Lat. North.	Long. West.	Time H. W.	Greenw. Time.	Rise.	Authority.
<i>American Coast.</i>						
	" "	H. M.	H. M.	H. M.	FEET.	
F. Nicolassky (Cook's Inlet)	60 15	10 6	3 49	1 55	28	Wrangell.
Harbour of St. Paul (Kodiack Island) ..	57 46	10 8	0 30	10 38	10	Russian navigators.
Harbour of Hilerarq	57 8	10 12	0 19	10 31	10	Russian navigators.
Nouchagak Bay	58 31	10 34	2 14	0 48	12	Wrangell.
<i>Alutian Isles.</i>						
St. Paul Island	57 10	11 30	3 47	3 7	4	Russian navigators.
Atka Island	52 25	11 30	0 20	11 56	6	} Russian navigators, doubtful.
Attou Island	52 57	12 28	2 48	1 16	22	
<i>Kamtschatka.</i>						
Petropaulovski	53 1	13 26	3 38	5 4	4	Lütke, in 1827.
" .....	....	....	3 43	5 9	..	Lütke, in 1828. Diurnal inequalities.
" .....	....	....	3 54	....	8	Du Petit Thouars.

Looking at the general assemblage of the numbers which occur in the column marked "Greenwich Time," it is evident that the tide wave of the hour 8, which is at Cocos Island and the Galapagos about 8 o'clock, comes to the continent at Nicoya and Realejo, about 10° and 12° North latitude, at about three-quarters of an hour later; while the tide is later than this, both to the northward and southward. Proceeding first southward, we find the line of 11 not far from Callao, that of 2 near Coquimbo or Valparaiso, and that of 3½ near Valdivia; and farther South we have the line of 5 at Chiloe, and of 6 at Cape Pillar; whence the wave moves to the eastward, round Cape Horn. Considering these points as fixed, it is easy to interpolate the other cotidal lines along this coast. The observed hour at Guayaquil is later than its position would give, a result which we should expect, since the tide will occupy some time in travelling up the gulf in which Guayaquil is situated.

Again, proceeding from Nicoya and Realejo, to the northward, we find a like progression of tide hours. The line 10 is not far from Acapulco, according to the data here collected. But the tide at Acapulco is small, and hence the accuracy of the result is doubtful. Perhaps the smallness of the tide is an indication that the point of divergence of the tide wave, which occurs on this part of the American coast, is not far from Acapulco. It appears that the line of 3 passes near San Blas, and also near the Bay of Santa Magdalena, on the coast of California. At Mazatlan, somewhat within the Gulf of California, the time is an hour or two later, as we should expect. When we reach Monterey and San Francisco the hour is about 6, according to Capt. Beechey's observations. The more recent ones are too anomalous to proceed upon. At Port Bodega, in lat. 38°, we have the 8 tide line; and at Nootka Sound, Cook's observations, which give 12h 30m (whence Greenwich IX nearly), are confirmed

by Capt. Kellett's observations in the Straits of De Fuca, South of Vancouver's Island. The next point is the Russian settlement, New Archangel, in the island of Sitka, where the tides exhibit very curious features, as I have already stated from the observations of Admiral Lütke, and, as I find, further confirmed by the observations of Sir Edward Belcher. The line belonging to Sitka appears to be 12½.

From this point we depend upon Russian observations, which are given by Admiral Lütke in his "Notice." These enable us to see that the cotidal lines bend, as usual, deep into the head of the bay in which is Cook's River (Inlet), in lat. 60°. The coast here trends to the West, and the wave follows it, and pursues its course along the chain of the Aleutian Islands, where it is traced by Admiral Lütke and the navigator of the Russo-American Company. It appears that the lines of 11, 12, 1, 2, fall near this chain, and that the line of 5 is near the coast of Kamchatka. It is not difficult to arrange the cotidal lines so as to conform to these data.

Admiral Lütke has observed the tides at other places on the Asiatic coast, as far North as 65°, but I shall not attempt to arrange them.

Our next attempt must be to arrange the tides of the oceanic isles of the North Pacific.

ISLES OF THE NORTH PACIFIC.

	Lat. North.	Long. West.	Time H. W.	Greenw. Time.	Rise.	Authority.
<i>Sandwich Isles.</i>		H. M.	H. M.	H. M.	FEET.	
Honolulu	21 18	10 32	3 35	2 7	2	Du Petit Thouars.
<i>Caroline Isles.</i>						
Uaian	5 15	13 7	3 35	4 42	5	Lütke.
<i>Ladrone Isles.</i>						
Gushan	13 32	14 20	8 23	10 43	..	Freycinet.
Bonin Isles	26 52	14 29	6 43	9 12	3	Lütke.
.....			6 3	....	..	Beechey.
Loo-Choo Isles	26 30	15 28	6 28	9 56	6	Beechey.
Sand Isle, Samboanga	6 55	15 52	7 36	11 28	4	Sir E. Belcher.
<i>Bashee Group</i>						
Batan Island	22 0	15 50	....	....	..	Sir E. Belcher.
Corean Archipelago ..	34 17	15 51	4 49	8 40	13	Sir E. Belcher. Anomalous.
Patchosan	26 20	15 41	6 36	10 17	5	Sir E. Belcher. Diurnal inequalities.
Hong Kong	22 12	16 23	9 37	2 0	6	Sir E. Belcher. Diurnal inequalities.
Amoy Harbour	24 16	16 8	12 52	5 0	18	Captain H. Smith.
Santubon	1 48	16 39	4 21	9 0	12	Sir E. Belcher.

These observations appear to imply a general motion westward of the tidal

wave; but I conceive that they are much too few and too unconnected to justify me in drawing cotidal lines; besides which, the smallness of the tides in the central parts of the ocean makes the observations more than usually doubtful, and is accompanied by some circumstances inconsistent with the notion of a simple progressive wave as the representation of the tidal phenomena of those seas. I will consider those circumstances for a moment.

Tides of the Central Pacific.

The tides over a great portion of the central part of the Pacific are so small that we may consider the lunar tide as almost vanishing. Thus, at Bau (or Bow) Island, it is stated as only 1 foot; at Tahiti it is hardly more; at the Sandwich Islands it is 2 feet; and even at New Ireland, where we are no longer in the central space, but among the larger islands to the West of it, the tide is only about 2 feet. But, moreover, at some at least of these places, the tide, small as it is, is not the *lunar* tide following the usual laws. At Tahiti, for instance, the time of high water appears never to deviate from noon by more than a certain difference, although Sir Edward Belcher has shown that it varies from about 9 a.m. to 3 p.m. At Bau Island there appears reason to believe that the limits are much the same; and, perhaps, at Carteret's Harbour, in New Ireland. Now it will be easily seen that such a result as this would follow if we were to suppose the tidal influence of the sun and of the moon to be equal. On this supposition it is plain that the high water would always occur halfway between the sun's transit and the moon's transit. Hence, at new moon, the high water would be at noon; as the moon went away to the eastward of the sun, the tide would be later and smaller; till, when the moon was six hour's distance from the sun, the tide would be at 3^h, but would in fact vanish. After this point the tide would re-appear at 9 a.m., or a little later, the inferior transit of the moon now taking the place of the superior one in determining the tide; and from this time the tide would be gradually later and larger till at full moon it would be again at noon; and so on. This appears to agree pretty well with the phenomena of the tides at Tahiti, as determined by Sir E. Belcher.

A more minute examination of the tides in these regions will enable us to pronounce more decidedly whether the law of the phenomena is that which has been just stated. And if it appears that the phenomena do follow this law, we shall have further to consider how such a motion of the sea in those parts is to be combined with the very different movements which occur in other places, and what is the general movement of the ocean which they indicate; whether, for instance, they are best explained by looking upon the lunar and solar parts of the tide, as produced by two separate waves, which may increase and diminish separately, and may start from different epochs in their motions. I shall not now pursue this point further; nor shall I further examine how far

the phenomena approach to the cases of fluid motion already described, in which there is a marked wave at the outskirts of the mass, and an approximate quiescence of the surface in the central parts; namely, the case of a stationary undulation, and of a revolving undulation, or rather a revolving cotidal line. I may remark, however, that the latter supposition, that of a revolving undulation, by which the tide is carried from California northwards along the American shore, and to the coast of Kamehatka, while the cotidal lines converge to some central point in the North Pacific, would explain the smallness of the tides at the Sandwich Islands.

The foregoing is that portion of Professor Whewell's important scientific contribution which refers to the North Pacific. Although some minor details may be modified by more recent observations, still, as the arguments are based on correct data, the conclusions remain unimpeachable. We have, therefore, deemed it right to repeat them in the present edition.

The following *Tide Table* is derived from the Admiralty lists, drawn up by Staff-Commander Harris, R.N., and give all that is necessary for the navigator.

TIDE TABLE.

Place.	High Water, Full and Change.	Rise. Springs	Place.	High Water, Full and Change.	Rise. Springs
<i>Central America, West Coast.</i>	H. M.	FT.		H. M.	FT.
Chepo River	3 40	15	Acapulco	2 40	2½
Pedro Gonzales (Tropic Island)	3 50	16	Punta Bay		7
Chamé Bay	4 0	16	San Blas	9 41	6½
Taboga	4 0	14	Manatlan	9 40	7
Panama Road	3 50	15-22	Guaymas Harbour	8 0	4
Port Nuevo	3 10	12	Colorado River entrance	2 15	25-30
Parida Island	3 15	10½	<i>California, and Oregon & Washington Territories.*</i>		
Nicoya Gulf (Port Herradura)	3 9	10	San Lucas Bay	8 28	4
Port San Juan del Sur ..	3 8½	10½	La Paz Harbour	8 27	4½
Port Rombo	3 6	11	Magdalena Bay	8 25	6½
Port la Union, Gulf of Fonseca	3 15	10½	Port San Quentin	9 30	6
Acajutla Road	2 25	9	Port San Bartolome	9 10½	7-9½
<i>Mexico, West Coast.</i>			Playa Maria Bay	9 20½	7-9½
Port Guatulco	1 30	5	Cerro Island	9 10	7-9
Port Sacrificios	3 15	6	Sta. Barbara's Island	8 0	3½
			San Diego Bay	9 42	6
			San Juan Anchorage	9 40½	5
			San Pedro Anchorage	9 45	4½
			San Miguel (Cuyler Harb.)	9 25	5

* The tides on these coasts are very complicated. There are generally in each lunar day two high and two low waters, which are unequal in height and in time in proportion to

Place.	High Water, Full and Change.	Rise, Springs	Place.	High Water, Full and Change.	Rise, Springs
	H. M.	FT.		H. M.	FT.
Santa Rosa Island	9 30 ¹	5 ²	Nanose Harbour, Van-		
Santa Catalina Island ..	9 35 ¹	5 ²	couver Island	5 0	15
Santa Cruz Island	9 35 ¹	5 ²	Pender Harbour, Strait of		
San Luis Obispo	10 8	4 ¹	Georgia	6 0	13
Monterey	10 22	4 ¹	Port Augusta	5 0	12
South Farallon	10 37	4 ¹	Hernando Island, Strait		
San Francisco, North			of Georgia	6 0	12-14
Beach	12 6	4 ¹	Sarge Narrows	6 0	12
Drake's Bay	11 41	4 ¹	Rendezvous Islands	7 0	14
Redoga Port	11 17	4 ¹	Stuart Island	6 0	12-14
Humboldt Bay	12 2	5 ¹	Waddington Harb., Bute		
Trinidad Harbour	11 11	7 ¹	Inlet	6 0	13
Crescent City	11 44	5 ¹	Gowlland Harbour, Dis-		
Port Orford	11 26	6 ¹	covery Passage	5 30	11
Coca Bay	11 26	6 ¹	Seymour Narrows	3 0 ¹	11
Yaquina River entrance	12 0	7 ¹	Cameleon Harbour, No-		
Columbia River entrance	0 20	3 8	dalas Channel	3 0	16
Astoria	0 42	7 ¹	Forward Harbour	3 0	16
Gray Harbour	12 12	7 ¹	Beaver Creek, Loughbo-		
Nesah Harbour	12 33	7 ¹	rough Inlet	3 0	16
New Dungeness	3 3	5 ¹	Topase Harbour	3 0	16
Port Townsend	3 49	6 ¹	Knox Bay	12 0	16
Port Steilacoom	4 46	11	Port Neville	0 30	17
Olympia	5 8	9 ¹	Port Harvey, Call Creek		
			Beaver Cove	0 30	10
			Alert Bay, Cormorant Id		
			Nimkish River	0 30	14
			Su-quash Anchorage	0 30	16
			Beaver Harbour	0 30	15 ¹
			Shushartie Bay		12
			Bull Harbour, Golesta-		
			Channel	0 30	12 ¹
			Blunden and Tracey Har-		
			bours, Queen Charlott		
			Sound	12 0	16
			Cypress Harbour, Sharj		
			Passage	12 0	16
			Deep Harbour, Fife Sound		
			Gullen Harbour	12 0	16
			Sunday Harbour & Dusky		
			Cove, Queen Charlott		
			Sound	1 0	13
			Farewell Harbour & Sar		
			gawent Passage, Knight		
			Inlet	1 0	15-15 ¹
			Quatsino Sound, Vanco-		
			uver Island	11 0	11

*Vancouver Island, British
(Columbia), &c.*

the moon's declination, differing most from each other when the moon's declination is greatest, and least when the moon is on the Equator. The high and low waters generally follow each other thus: from the lowest low water, the tide rises to the lower of the two high waters (sometimes improperly called "half tide"), then falls slightly to a low water (which is sometimes merely indicated by a long stand); then rises to the highest high water, whence it falls again to the lowest low water.—*Tide Tables for the Pacific Coast of the United States.*

• May to October, from midnight to 3 a.m. November to April, from noon to 3 p.m.

THE TIDES OF THE NORTH PACIFIC OCEAN.

1227

Rise, and Ft.	Rise, and Ft.	Place.	High Water, Full and Change.	Rise, Spring.	Place.	High Water, Full and Change.	Rise, Spring.
0	15	Klaskino Inlet, Vanc. Id.	H. M.	FT.	Port Kuper, Q. Char. Ids.	H. M.	FT.
0	13	Klaskish Inlet "	12 0	12	Anadyr Bay	1 40	13
0	12	Nasparto Inlet "	12 0	12	St. Lawrence	9 50	9?
0	12-14	Ou-Ou-Kinah Inlet "	12 0	12	Good-news Bay	8 15	11?
0	12	Kyuquot Sound "	12 0	12	Golovin Bay	6 15	13
0	12	Esperanza Inlet "	12 0	12	Port Clarence	6 23	3
0	14	Nuchatlitz Inlet "	12 0	12	Chamisso Island	4 25	
0	12-14	Nootka Sound "	12 0	12	Point Barrow	4 42	
0	13	Barclay Sound	12 0	12		11 45	4-4
0	13	Clayoquot Sound	12 0	12			
30	11	N.W. America, Alaska,			Kamchatka.		
0?	11	ft.			Avatcha Bay	3 30	6
0	16	Takush Harbour, Smith			Gulf of Tartary.		
0	16	Inlet	1 0	14	Cape Maria (Saghalin Id.)		
0	16	Fitzhugh Sound, Schooner			Sea of Okhotsk	2 0	5
0	16	Retros	12 30	14	Amur Strait	11 40	5-6
0	16	" Namu Harbour ..	1 0	15	Jonquière Bay (E. coast)	10 0	6
0	16	" Welcome Harbour	12 0	15-16	Castries Bay	10 30	5 8
30	17	Fisher Channel, Port John	1 0	13	Barracouta Harbour ..	10 0	3-4
30	19	McLaughlin Bay, Lama			Aniwa Bay, Tobootchi ..	4 16	3
13		Passage	1 0	14	Port Michael Seymour ..	5 30	3
13		Kynumpt Harbour	0 30	14	Napoleon Road (W. coast)	2 30	2
30	14	Port Blakeney, Millbank			St. Vladimir Bay	irr.	2
30	16	Sound	12 0	13			
30	16	Finlayson Chanl., Nowish			Japan.		
12		Cove	12 0	12	Yama Gawa Harbour ..	7 32	9
		" Klemto Passag.	12 0	13	Kogosima	6 50	10
30	12	Holmes Bay	1 0	13	Koshiki Islands	7 41	7
		Coghlan Anchorage	12 30	18	Sagitsu-no-ura Harbour ..	8 0	9
		Low Inlet	12 30	17	Nagasaki Bay	7 15	9
0	16	Klewnugget Inlet, Gren-			Tsuké, Hirado sima	9 44	8
0	16	ville Channel	12 30	17	Goto Islands, Ojika seto	8 40	10
0	16	Kdyo Passage, Refuge Bay	1 30	17-22	" Oosuka ..	9 15	8
0	16	Ogden Channel, Alpha Bay	1 0	20	Tsu sima, Korea Strait ..	8 30	8
0	16	Medak-Catlah, Chatham			Yobuko	9 16	9
		Sound	12 0	21	Simonoseki	8 30	8
		Porte Canaveral and			" Hiku sima ..	9 0	4
0	13	Stephens	12 30	18	Miyadsu Harbour	2 5	1
		Qlawdsset Anchorage	1 30	17-22	Oki Island, Saigo	3 16	1
		Port Simpson	1 30	17-22	Tsuruga	1 30	2
0	15-15	Nass Bay	1 5	23	Nanso North Harbour ..	2 50	1
0		Observatory Inlet	1 5	23	Niigata	3 10	1
0		Portland Inlet	1 30	23-27	Sado Island, Yobisu ..	5 0	2
		Sitka?	0 33	9	Tangar Strait	5 0	5
		Behring Bay	0 30	9	La Pérouse Strait	10 30	6
		Port Etches	1 15	9	Yezo Island, Hakodate ..	3 37	3
		Port Chalmers	1 0	13	" Endermo Harb.	4 35	5
		Port Chatham	1 0	12	" Akishi Bay	4 30	5
		Ounabushka Island	7 30	7	" Nemoro	5 0	1
		Cape Koshnoff	7 30	15	" Not-ko Bay	4 50	4
		Skidegate Inlet, Queen			" Okusiri	3 30	1
		Charlotte Islands	1 0	17			

* The tides at Sitka are affected by diurnal inequality. Commander Pearce, H.M.S. *Alert*, 1860, states that the rise does not exceed 7 feet, but on the authority of Commander Pike, H.M.S. *Devastation*, 1862, the local pilots say that the rise sometimes is as much as 16 feet.

Place	High Water, Full and Change.	Rise. Springs	Place.	High Water, Full and Change.	Rise. Springs
	H. M.	FT.		H. M.	FT.
Miyako Bay.....	3 35	3½	Seto Uchi, Siyako Island	12 16	9½
Yamada Harbour	4 30	4	" Miwara.....	10 37	11
Inu-bo-ye saki	5 45	4½	" Hangata	10 36	11½
Kata' ura Bay.....	5 10	5½	" Gogo sima	10 10	11
Yokohama	6 0	6½	" Hime sima Road..	8 45	8
Yokosuka Harbour	5 15	8			
Tatsumi Bay	5 50	5	<i>Islands.</i>		
Fatassio.....	6 0	6			
Simoda Harbour.....	5 20	6	Sandwich Islands, Keala-		
Aran Bay.....	5 40	6	kekua Bay	3 49	2½
Shimada	7 30	7	" Honolulu....	4 25	2½-3
Matoya Harbour	6 50	6	Christmas Island.....	4 23	3½
Hamagema ura	6 15	6	Howland Island	7 11	8
Owasi, Rodney Bay	7 0	5½	Gilbert Islands, Tarawa	4 0	6
Urakami	7 30	6	Marshall Ids., Port Rhin	5 0	6½
Oosima	6 50	6	" Ebon Atoll..	4 45	6
Tanabé, Kii Channel	6 0	6	" Wotje.....	2 30	7
Yura-no-uchi	6 0	5½	Caroline Islands, Port		
Osaki Bay	5 55	6½	Metalanism	4 20	3-4½
Susaki & Nomi Harbours	6 0	6½	Pelew Islands		6
Uwajima	12 0	8-9	Ladrone Islands, Saipan	6 45	2½
Aburatsubo	6 3	5½	Bonin Ids., Port Lloyd..	6 8	3
Seto Uchi, Hiogo & Kobé	7 15	6½	" Coffin Harbour	11 32	3½
" Osaka River, entr.	7 30	6½	Lu-chu Islands, Napha		
" " City	8 17	2½	Kiang Road	6 32	7
" Naruto, Fukura ..	6 14	6½	Meiseo sima Islands, Port		
" Awasima Island ..	12 7	10½	Haddington	6 45	7

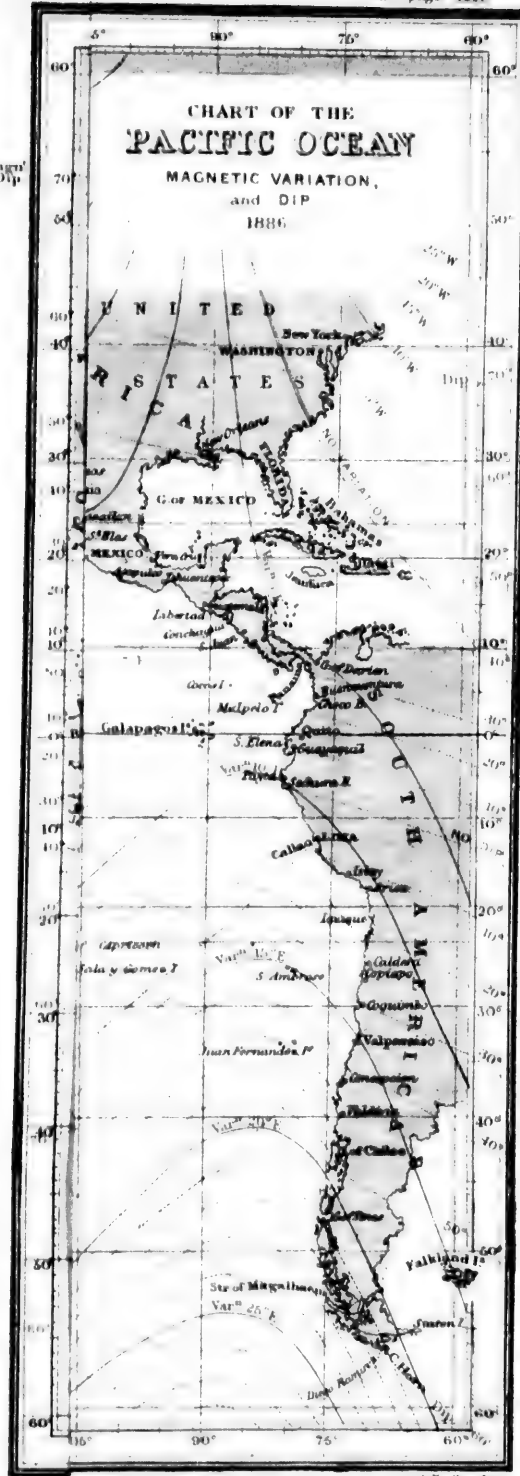
2. MAGNETIC VARIATION.

The accompanying illustrative diagram will best elucidate this important subject. To follow all the details of change in direction and intensity in the magnetic elements encountered in a long voyage, would lead into a far larger discussion than would be compatible with the scope of this work.

But a due consideration of these essential features of magnetism is of the utmost importance to the safe conduct of a ship, and the reader is referred to Mr. Towson's "Practical Information," or the "Admiralty Manual," for the necessary instructions in the management of his compass, whether corrected for local deviation or not, in the varied magnetic changes through which he will pass in the long voyage to the field of our present work.

The principal authority on this subject is the chart drawn up by Capt. F. J. Evans, R.N., late hydrographer to the Admiralty. This is the result of the discussion of an immense number of observations corrected for the numerous sources of error, which so often render the observations made on board ship so much at variance with the real variation. Since the vast increase of iron ships, and the use of iron in wooden ships, these errors and the liability to them have

Fr. And go.	Rise. Springs
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21	3 ^h
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30	7
20	3—4 ^h
45	6
8	2 ^h
32	3 ^h
32	7
45	7

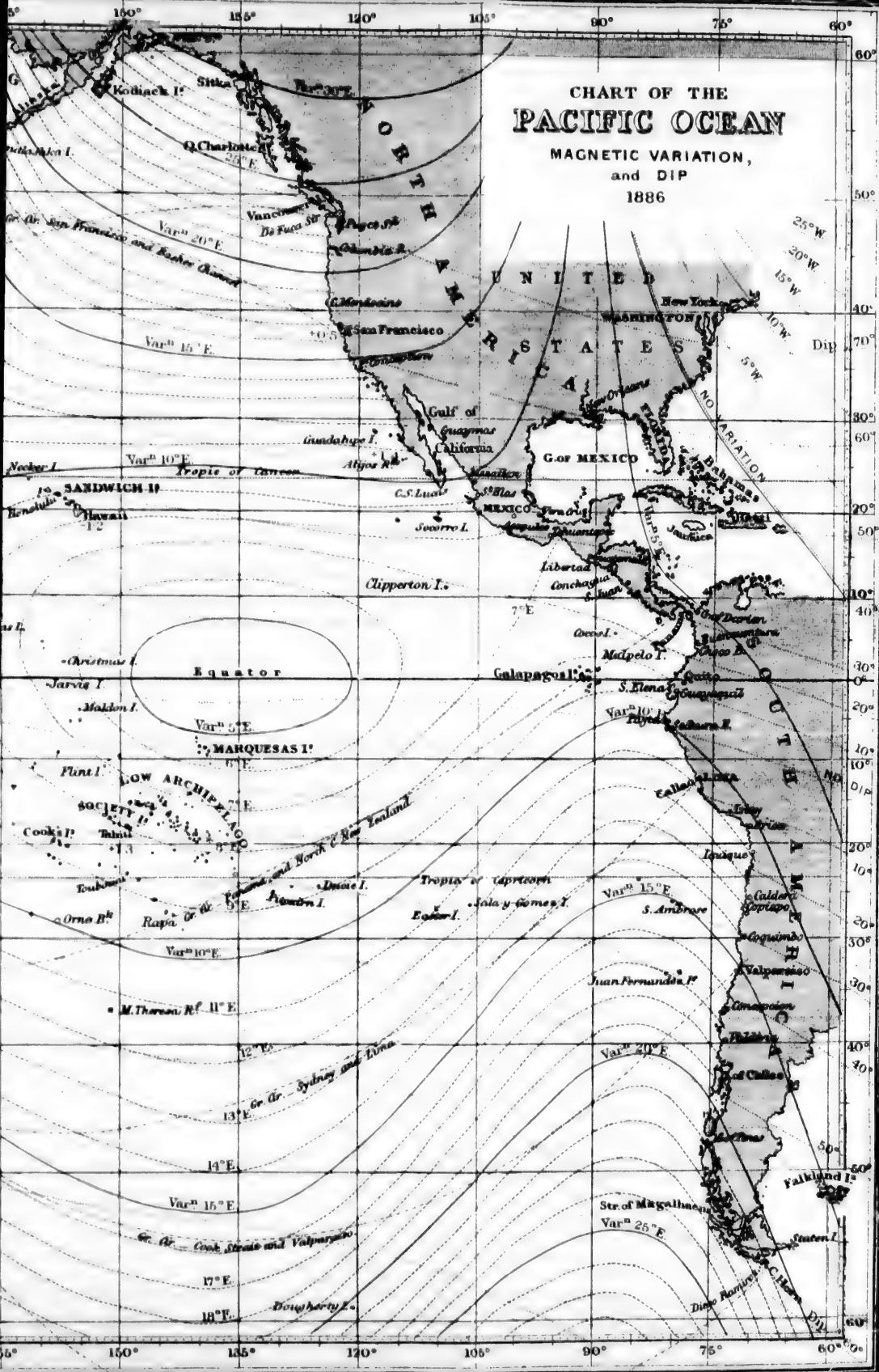


A Friday feast

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- + 1.73
- + 1.19
- + 0.84
- + 0.57
- + 0.36
- + 0.18
- 0
- 0.18
- 0.36
- 0.57
- 0.84
- 1.19
- 1.73

A. Fadlay fecit.

Great Circle between Cook Strait and Cape Horn.

vastly increased, as is well known. The establishment, therefore, of these magnetic meridians is a most important boon to the sailor.

The *isogonic lines*, or those upon which the variation is of the same amount, are given on the illustrative diagram, and are generally as accurate as the ordinary ship's compass will show it when at sea; at all events sufficiently exact for the purposes of navigation, and they will moreover serve to draw attention to any unsuspected change in the magnetism of the ship, should such change occur, and besides afford the sailor some information when observations cannot be had.

On this diagram is inserted the amount of annual change, or the *secular variation*, at present going on in different parts. The chart being adapted to the epoch of 1886, multiplying the time elapsed between this date and any future year by the quantity of increase or decrease given, will give the amount of variation for that time.

3. ICE.

Floating ice has little or no influence upon the navigation of the North Pacific Ocean, its northern border being practically always free from ice, except possibly a rare fragment formed in some narrow passage or drifted South by some severe winter gale. In the Okhotsk and Behring Seas, however, ice is prevalent in winter as the remarks on pp. 742 and 684, and the following observations by M. W. H. Dall, show.

So far as the Okhotsk Sea and the narrow channels leading to it are concerned, they may be said to be practically closed by ice in winter, such parts of them as are not actually frozen over being encumbered with drifting cakes or large fields of ice.

Bering Sea is partially obstructed by ice in winter, and partly free from it, its southern portion along the Aleutians being rarely, if ever, troubled by ice. The southern limit of the ice varies considerably with the particular season and the direction of the prevailing winds; it appears to extend from a point in about lat. 57° on Aliaska Peninsula, curving to the northward and westward toward the Pribiloff Islands, and generally passing at least a degree to the North from them; then, curving again to the southward, it generally presents a broad tongue in about long. 174° , often reaching to the vicinity of lat. 56° , and then extending in an irregular line westward, usually between lat. 56° and 58° , toward the coast of Kamchatka, off which it forms a belt 15 to 30 miles in width, which is often entirely dissipated for short periods by westerly winds.

In May and June the barrier first becomes penetrable in the western portion of Bering Sea in the vicinity of Cape Navarin. The frozen surface is rotten all over the sea by the end of May, and the whalers push boldly into the broken

slushy ice. The ice always opens West of St. Lawrence Island before it is open East of the island, and clears out from Bering Strait in July.

The season of navigation for Bering Sea and the Aleutians may be approximately placed between April 10 and October 20.

II.—DENSITY, TEMPERATURE, DEPTH, ETC., OF THE OCEAN.

The topics which will be briefly alluded to in this section, are rather subjects of interest to the general enquirer, than directly useful to the mariner in his vocation. They are much more fully discussed in the "North Atlantic Memoir," and the "South Atlantic Directory," to which the reader is referred. Further information will be found in the authorities mentioned there, and in the notes below.

1. DENSITY.

The source of the salts existing in sea-water is rock-substance which has been disintegrated and decomposed by atmospheric influences. The soluble components or products washed out by the rain, and collected in the streams and rivers, are eventually poured into the sea. Here the water is subjected to the action of the sun and winds, which causes it to evaporate, leaving the salts behind. A great quantity of the vapour so formed is carried inland, and condensed on the mountains, washing out the rock and taking up a fresh charge of solid matter which it brings down into the sea. Although the ocean is thus the receptacle of the drainage of all the land, it is by no means uniform in saltiness, the variations being due to the different meteorological conditions which obtain in the different zones of the earth.

In the Pacific Ocean the distribution of the surface salinity differs considerably from that in the Atlantic. In the Pacific only the southern concentration area is well marked; in the northern part of the ocean the variations in salinity are slight, and the mean saltiness low. In no part of the North Pacific was the specific gravity observed above 1.0265, while in the southern part, in the region of the trade wind, it exceeds 1.0270, and the mean specific gravity is comparatively high. The maximum in the North Pacific is 1.02644 in lat. 30° 22' N., and in the South it is 1.02719 in 19° S. near the Society Islands. The whole of the Southern Ocean, between 40° S. and the edge of the ice, appears to have a very uniform surface specific gravity of about 1.0250, that of the bottom water of the Pacific being from 1.0257 to 1.0259.*

Mr. Buchanan concludes that, as a general rule, both in the Atlantic and

* See a Paper "On the Distribution of Salt in the Ocean," by J. Y. Buchanan, Chemist in the *Challenger* Expedition, printed in the "Proceedings of the Royal Geographical Society," vol. xxi., pp. 255—257, and in the *Journal of the same Society*, vol. xlvii., 1877, pp. 72—86.

Pacific Oceans, between 40° N. and 40° S., the specific gravity (salt) is greatest at or near the surface, and decreases more or less regularly until a minimum is reached, generally 400 fathoms from the surface, whence there is a slow rise, the bottom water being slightly heavier.

2. TEMPERATURE.

The temperature of the ocean depends mainly on three conditions—latitude, currents, and season. Owing to the unequal exposure of the different portions of the spherical surface of our planet to the rays of the sun, the amount of solar heat received gradually diminishes from a maximum between the tropics to a minimum in the polar regions. We find, in consequence, that the temperature of the surface-layer of the ocean decreases as we proceed from the Equator towards the Poles, slowly at first, between the tropics, more rapidly in the temperate zones, until it falls to zero, and even below zero, before we reach the Arctic and Antarctic Circles.

The sun in his apparent progress from tropic to tropic draws the whole system of terrestrial, including atmospheric, temperatures after him from one hemisphere to the other; but the water of the ocean, absorbing heat much more slowly and retaining it much longer than the atmosphere, is less subject than the latter to those extremes of temperature caused by the change of the seasons. A range of 10° F., reduced to a few degrees between the tropics and within the polar circles, measures the difference between the mean temperature of the surface-layer in the warmest and coldest months of the year.—*Mr. J. J. Wyld.*

The sea plays a very important part in that combination of the meteorological phenomena of a place or country which we call climate. It must be regarded as the great reservoir from which the atmospheric water chiefly rises to form clouds and rain, but into which all the downfall is again finally collected. But with the water there is also collected a great part of the heat which the land had received by insolation, and it is stored up for colder seasons and climates, and carried to them by currents and winds.—*Professor J. J. Rein.*

The whole mass of the water of the ocean may be considered as divided into two layers, the upper comparatively superficial and rapidly cooling from the surface downwards, the lower of incomparably greater amount, extending to the bed of the ocean, and of nearly the same temperature throughout. The bottom-water of the Pacific, like that of the Atlantic, is doubtless an extremely slow indraught from the Antarctic seas.*

* "Proceedings of the Royal Geographical Society," vol. xx., 1876, p. 410; see also lecture by Dr. Carpenter "On the Temperature of the Deep-Sea Bottom," in the "Proceedings of the Royal Geographical Society," vol. xxi., 1877, p. 314, &c.; the Reports from the officers

From 40° N. to 40° S. (in the Pacific Ocean) the temperature of the 1,500-fathoms line remains the same (34° to 35° F.). Below that line the water is slightly colder in the South than in the North Pacific; while above that line, to the 200-fathoms line, the water is colder in the North than in the South Pacific. But though the bottom-water is colder in the South than in the North Pacific, yet, from the much greater depth of the latter, the body of water there whose temperature is below 35°, is vastly greater than in the former, an excess averaging 750 fathoms. As in the Atlantic, so in the Pacific, we find that the water at the bottom in the western portion is colder than that of the eastern, which is caused by the revolution of the earth trending the northerly-flowing current to the westward.*

The highest surface temperature found in the Pacific Ocean, during the cruise of H.M.S. *Challenger*, was 84° in lat. 2° 33' S., long. 144° 4' E., off the North coast of New Guinea. This was on March 1st, 1875. The lowest surface temperature was 52°·5, on October 25th, 1875, in lat. 39° 16' S., long. 124° 7' W., nearly midway between New Zealand and the coast of Chile.

Further remarks on the temperature of various parts of the North Pacific Ocean will be found in the Chapter relating to the Currents.

3. DEPTH.

It is only within the last few years that any serious attempts have been made to explore the depths of the Pacific Ocean. Of the principal expeditions for this purpose may be mentioned those of the U.S. ships *Tuscarora* and *Alaska*; H.M. ships *Challenger* and *Alert*, and the steamer *Dacia*, and the German war-vessel *Gazelle*. But notwithstanding the numerous soundings taken from these vessels, before we can form an accurate idea of the conformation of the bed of the Pacific Ocean, many more observations are necessary.

Dr. Petermann has endeavoured, by uniting all the available observations, to form a chart of the bed of the Pacific, by which it would appear that it is divided into two regions by an arc of a great circle joining San Francisco and the East coast of New Zealand. The region East of this line seems to be moderately even, with depths of between 2,000 and 3,000 fathoms. The western region, on the contrary, has a number of deep depressions, and here a greater depth has been found than in any other part of the world.†

of the *Challenger* Expedition; and the "Charts showing the Surface Temperature of the Atlantic, Indian, and Pacific Oceans," published by the Authority of the Meteorological Council, 1884.

* "Log Letters from the *Challenger*," by Lord George Campbell, 1876, pp. 395, &c. See, also, "*Thalassa*," by J. J. Wild, mentioned in the note on p. 1202; and "Notes by a Naturalist on the *Challenger*," by H. N. Moseley, M.A., F.R.S.

† "L'Année Géographique," Paris, 1879, pp. 117-120; and Petermann's "Geographische Mittheilungen," Gotha, April, 1877.

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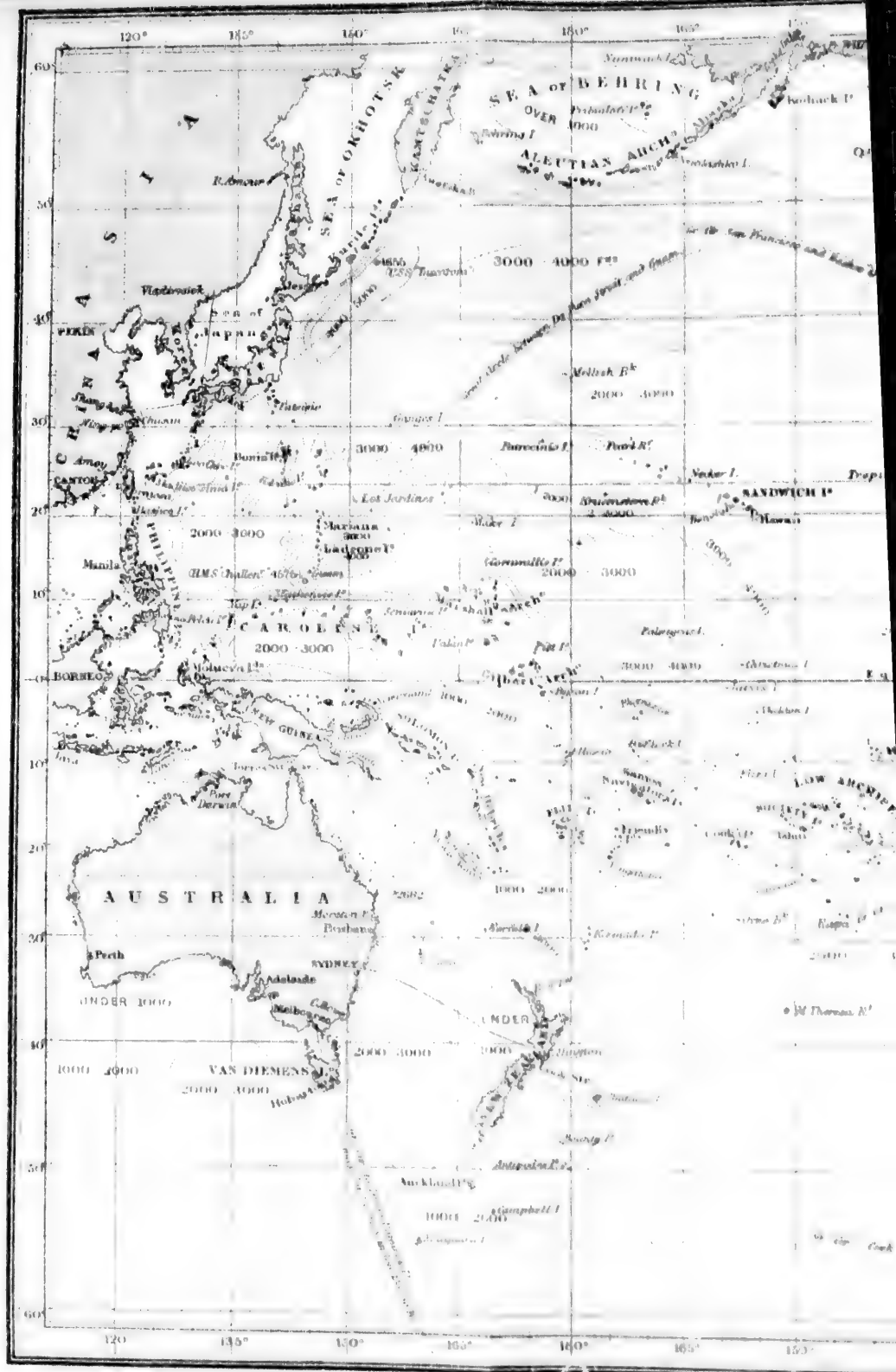
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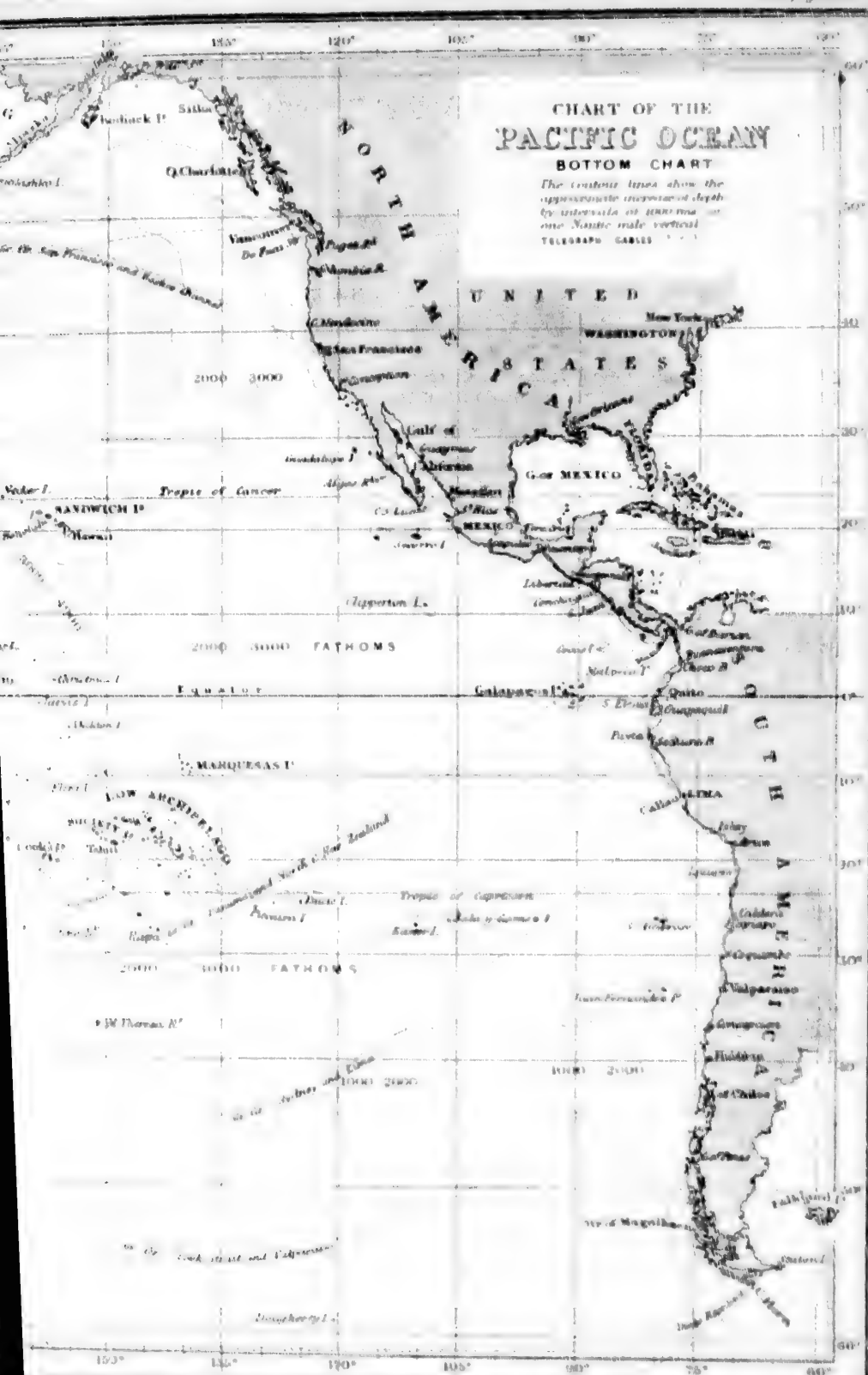
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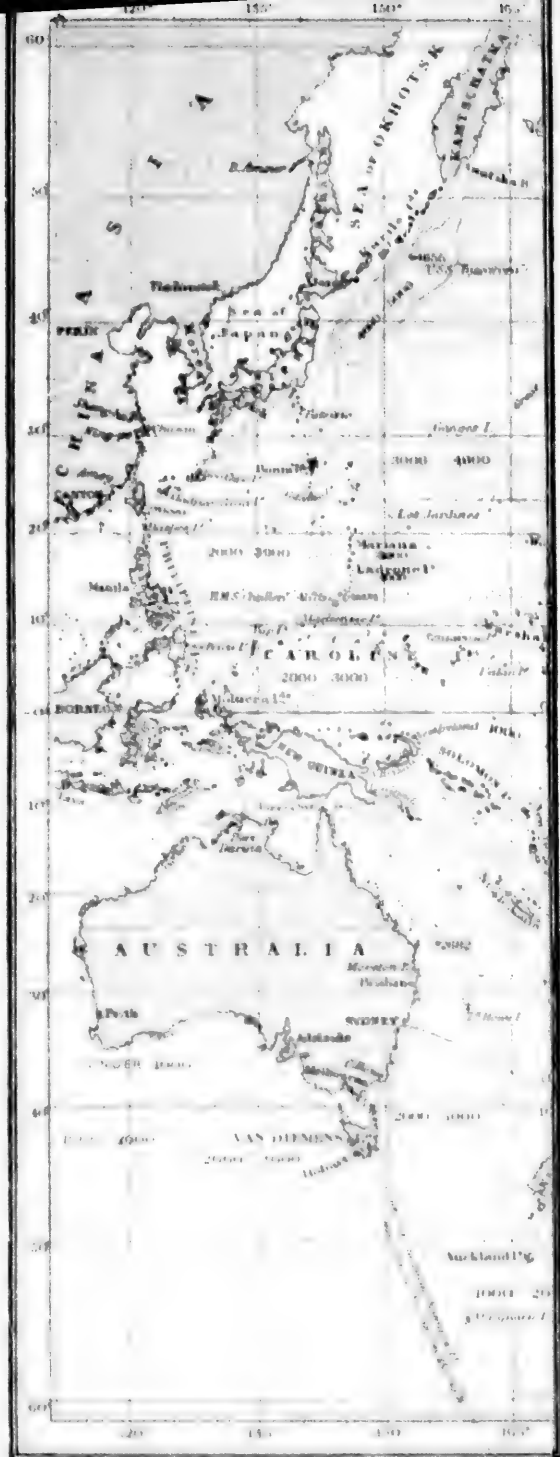
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In the North Pacific the *Tuscarora* attained the greatest depth yet found, 4,655 fathoms, or over $5\frac{1}{2}$ statute miles, in lat. $44^{\circ} 55' N.$, long. $152^{\circ} 30' E.$, to the S.E. of Urup Island, one of the Kurile Islands. The greatest depth found by the *Challenger* was 4,575 fathoms, in lat. $11^{\circ} 24' N.$, long. $143^{\circ} 16' E.$, to the S.W. of the Mariana or Ladrone Islands; the bottom was composed of red clay, with a thick top layer of pumice and manganese; the temperature being $33^{\circ}.9$. The greatest depth found in the South Pacific was 2,750 fathoms, in lat. $7^{\circ} 25' S.$, long. $152^{\circ} 15' W.$, to the S.E. of Starbuck and Malden Islands. With a heavy sounding weight it takes about $1\frac{1}{2}$ hour for the line to reach the bottom in a depth of 4,500 fathoms, and 35 minutes in 2,500 fathoms.

The pressure exerted by the water at great depths is enormous, and almost beyond comprehension, amounting roughly to a ton on the square inch for every 1,000 fathoms. Marine animals no doubt easily accommodate themselves to these enormous pressures. Their tissues being entirely permeated by fluids, the pressure has little or no effect upon them. No sun-light penetrates the deep sea; probably all is dark below 200 fathoms. The waters of the deep sea being thus everywhere dark, and always cold, the conditions of life in them are the same all over the world.—*Mr. H. N. Moseley.*

From temperature observations on board H.M.S. *Challenger*, the space between the N.E. coast of Australia and New Caledonia, New Hebrides, Solomon Islands, and New Guinea, appears to be surrounded by a bank, not exceeding 1,300 fathoms in depth, the temperature within this area at a depth of 2,650 fathoms being 35° , or the same as at a depth of 1,300 fathoms.

Another similar area, between New Guinea and the South part of Japan, appears to be surrounded by a bank of 1,500 fathoms. Mr. J. J. Wyld says this deep basin might appropriately be called the "Sea of Magallanes," after the discoverer of the Ladrone and Philippine Islands, and in honour of the first European who crossed the Pacific Ocean. One of the most prominent features of this sea is the extensive surface-stratum of warm water, 84° to $77^{\circ} F.$, from 70 to 100 fathoms thick.

Between the Sandwich Islands and Tahiti, and in a southerly direction from Tahiti to $40^{\circ} S.$, Professor W. Thomson describes the bottom as consisting mainly of red clay, except around volcanic islands, where it is chiefly composed of volcanic débris and shore-mud. In nearly all the soundings manganese was found. In depths exceeding 2,000 fathoms, in other parts of the ocean, the bottom appeared to be principally red clay, and occasionally gray ooze.

The accompanying diagram is taken from Dr. Petermann's chart, previously mentioned, but it is necessarily very imperfect, from the comparatively small number of soundings taken in this vast area.

CHAPTER XVIII.

PASSAGES.

From what has been said of the meteorology of the North Pacific, it will be manifest that its navigation is simple and easy in every part, with the important exceptions of those places lying in the belt of calms, &c., especially the Bay of Panama. A voyage across the Pacific is carried on without difficulty, going eastward in the extra-tropical portion influenced by the anti-trade wind, and to the westward within the area of the N.E. trade wind. This applies to the eastern portion of the ocean, and whatever variations from a direct course on the western side may be necessary, are due to the shifting monsoons of the China and other Asiatic coasts. These monsoons, and their influences on navigation, are described in our Directory for the Indian Ocean, 1882, pp. 28 to 65, and in that for the Indian Archipelago, &c., 1878, pp. 1 to 32, and, as the countries most affected by them are described in those works, although they form the western boundary of the Pacific, the reader is referred to them for the necessary information.

One subject relating to over-sea navigation in such extensive oceans as the Pacific, great circle sailing, is very important, as it is under these circumstances that the greatest saving of distance is effected, by the choice of such routes or those approximating to the shortest distance in angular measurement. It will not be necessary further to allude to the subject here, as it has been dilated on in our volume on the South Pacific and in other works specially devoted to mathematical geography. Some of the great circle tracks are shown on the adjoining diagram, and these must suffice.

The following notes on the general tracks across the North Pacific are derived from various sources as quoted, and also from the valuable work by M. F. Labrosse.* Some additional information will be found in the South Pacific Directory.

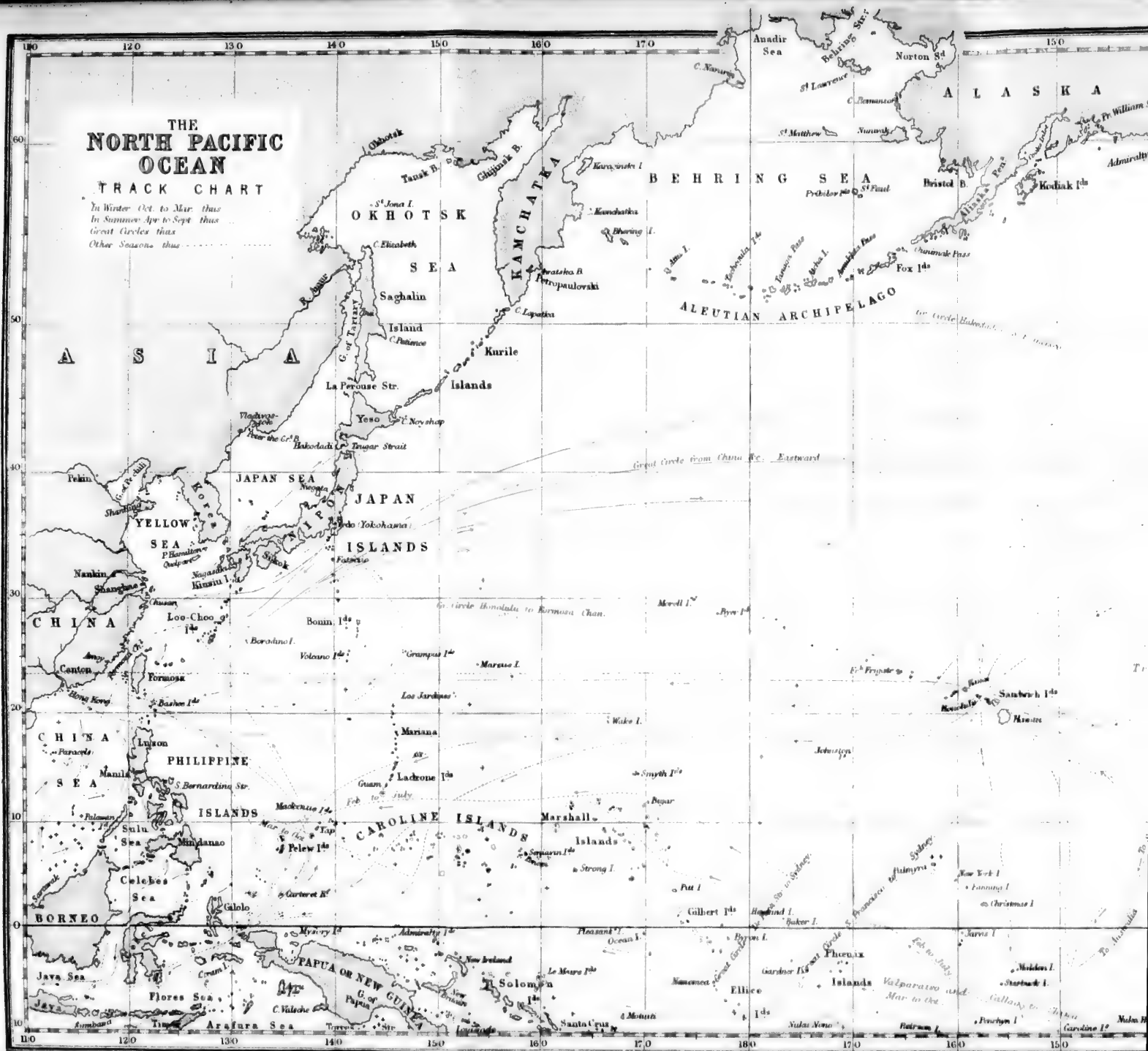
* In 1875, the United States Hydrographic Office published a translation of this work by Lieut. J. W. Miller, U.S.N., entitled "The Navigation of the Pacific Ocean, China Seas, &c."

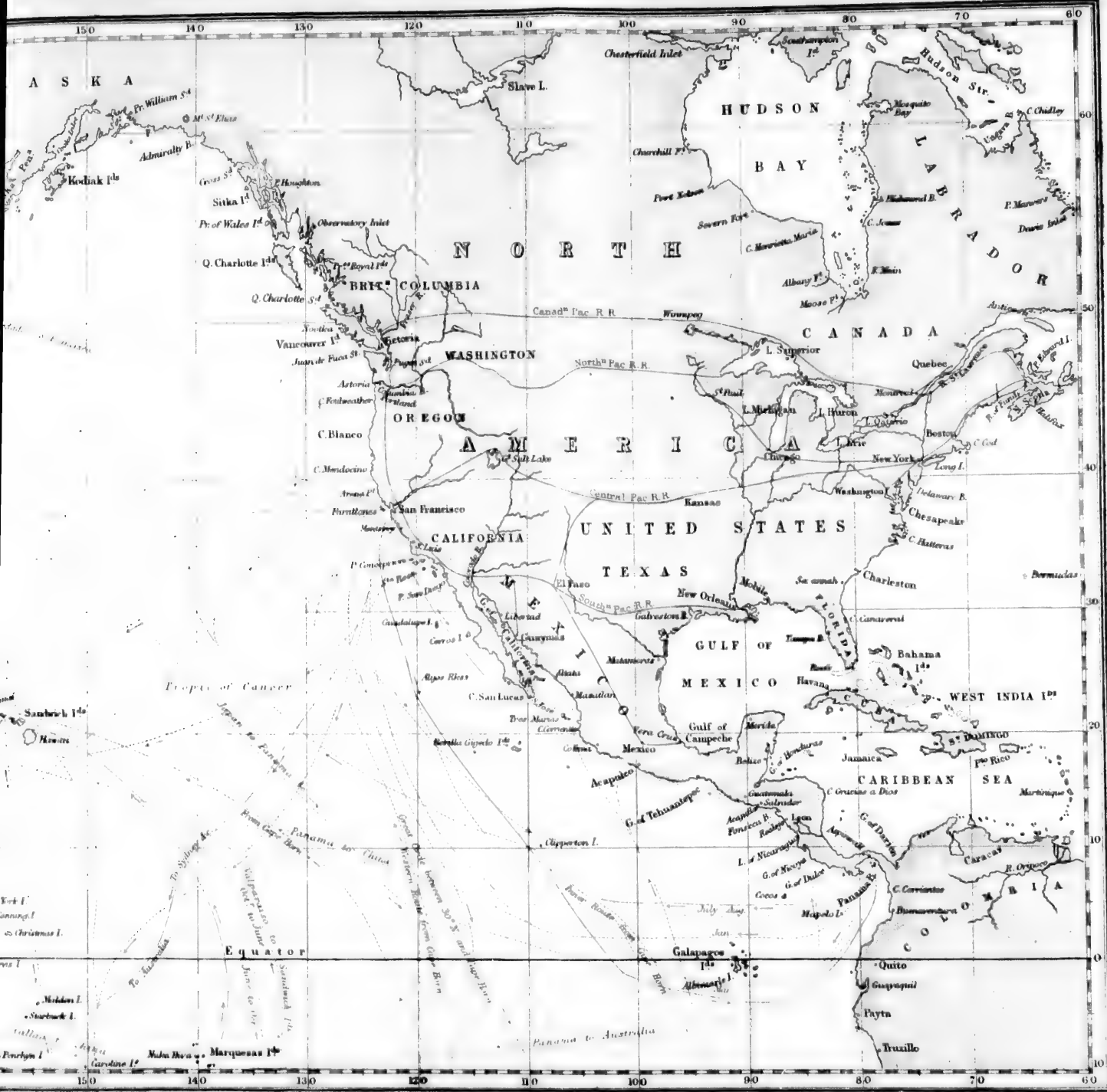
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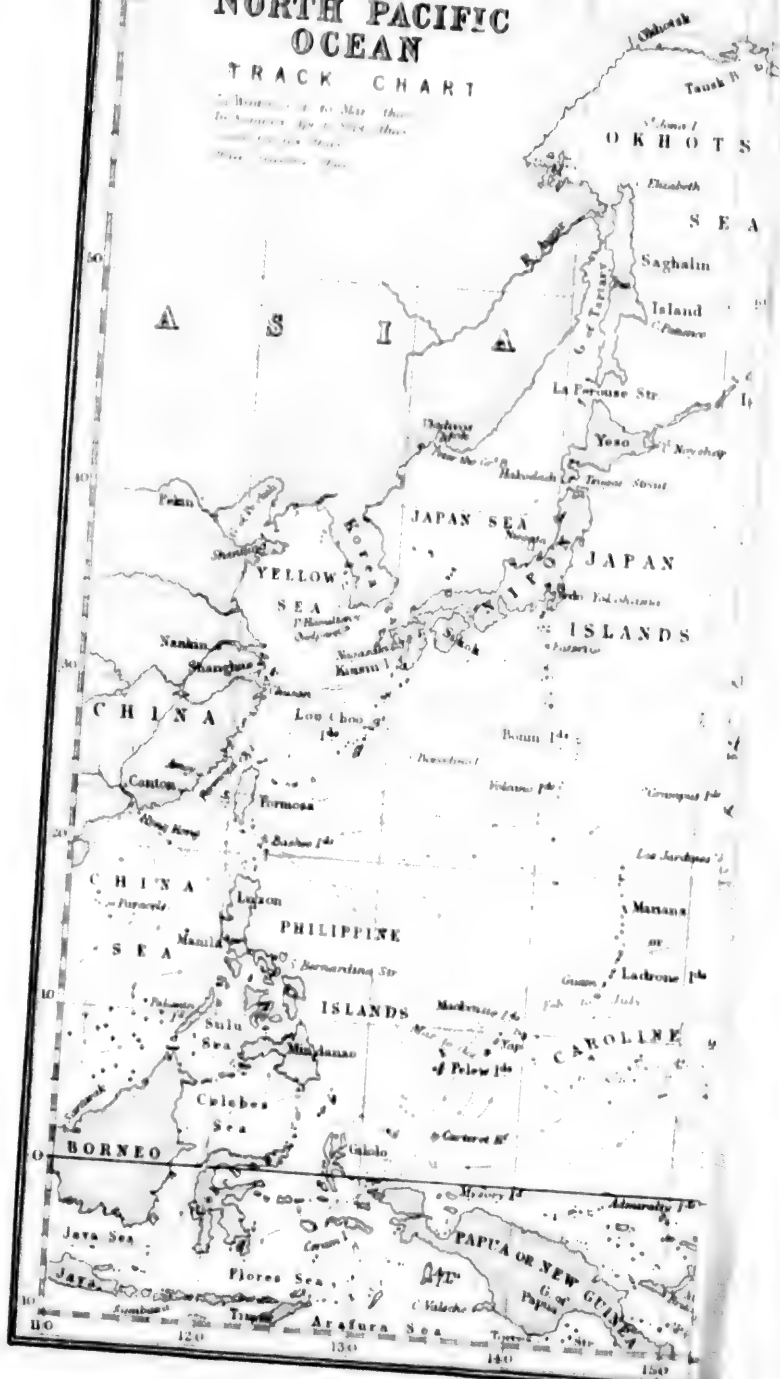




THE NORTH PACIFIC OCEAN

TRACK CHART

In Winter, 1st to May, then
In Summer, 1st to Sept. then
In Autumn, 1st to Nov. then
In Winter, 1st to Feb.



CAPE HORN TO CALIFORNIA AND BRITISH COLUMBIA.

In the Pacific, as in the Atlantic Ocean, the route from South to North, or vice versa, by crossing the different belts of winds and calms, requires much consideration as to the best points for crossing the various parallels of latitude and the Equator. The entering or leaving one zone at the most advantageous point has a very great influence on the speed and safety of the ship through the rest. Therefore this meridional voyage must be considered with reference to the countries beyond the scope of this work. What has been previously said on the winds and currents will be necessary to understand the requirements of this section.

To Captain Maury, and also to the Dutch Meteorological Institute, under Captains Jansen and Van Gough, we owe very much for their lucid discussions and long series of examples from which a correct decision may be arrived at. We therefore quote the words of the former, but omit the tables upon which the conclusions are based. They are very interesting, but to insert them would unduly enlarge this work.

The California-bound vessels should aim to enter the S.E. trade-wind region of the Pacific as far to the West, provided they keep on the eastern side say of 118° W., as they well can; they should not fight with head winds to make westing, nor should they turn much from the direct course when the winds are fair. But when winds are dead ahead, stand off to the westward, especially if you be South of the trade-wind region. Having crossed the parallels of 35° S., and taken the trades, the navigator, with the wind quartering and all sails drawing, should now make the best of his way to the Equator, aiming to cross it between 105° and 120° , according to the season of the year, and the directions hereinafter given.

I wish here to call the attention of navigators to the winds they are to expect between the parallel of 50° S., in the Pacific, and the Equator especially, as it regards their reliability.

The distance from the fairway of St. Roque (lat. 7° S.) to the parallel of 50° S., in the Atlantic, is about 2,900 miles, the average time 30 days, and the mean daily run is about 100 miles.

The distance from 50° S., in the Pacific, to the usual crossing-place on the line—California track—is about 3,300 miles, the average time 27.7 days, and the mean daily run 132 miles.

The winds between 50° S. and the Equator are much more strong, steady, and reliable, as the barometer would lead us to expect, on the Pacific, than they are on the Atlantic side of the continent; the ratio between them in these respects is greater than 2,900 to 3,300, for it is easier to make 3,300 miles with them in the one ocean than it is 2,900 in the other.

An examination of the mean monthly passages from crossing to crossing will

also show a greater regularity, implying thereby more stable winds. The greatest monthly average on the East side is 31.1 days in August; on the West 27.9 in May, extreme difference, 3.2 days; the greatest monthly average on the West side being 27.9 days; the least 22.2 days; the extreme difference is 5.7 days.

Between the Equator and 10° or 12° N., according to the season of the year, the California-bound navigator may expect to lose the S.E., and to get the N.E. trade winds.

He will find these last nearer the Equator in January, February, and March; but in July, August, and September, he will sometimes find himself to the North of the parallel of 15° N. before he gets fairly into the N.E. trades. And sometimes, especially in summer and fall, he will not get them at all, unless he keeps well out to the West. Having them, he should steer a good rap-full at least, aiming, of course, to cross the parallel of 20° N., in about 125° W., or rather not to the East of that, particularly from June to November. His course, after crossing 20° N., is necessarily to the northward and westward, until he loses the N.E. trades. He should aim to reach the latitude of his port without going to the West of 130° W., if he can help it, or without approaching nearer than 250 or 300 miles to the land, until he passes out of the belt of the N.E. trades, and gets into the variables, the prevailing direction of which is westerly.

"Where shall we take the S.E. and lose the N.E. trades on the passage to California?" is an important question for a navigator to have answered, who is striving for a short passage on the West coast of South America. From the parallel of Cape Horn up to the belt of light winds and calms, through which you generally pass before getting into the S.E. trades, the prevailing winds are westerly winds, having nothing more frequently than southing in them.

Between the N.W. coast and the meridian of 130° W., from 30° to 40° N., the prevailing direction of the wind in summer and fall is from the northward and westward, whereas, to the West of 130° , and between the same parallels, the N.E. trades are the prevailing winds of these two seasons. There is a marked difference in the direction of the winds on the opposite sides of the meridian of 130° W. in the North Pacific. The cause of this difference has been completely unmasked by the researches connected with these charts. The agent which produces it has its seat in the arid plains of New Mexico, Northern Texas, and the regions round about. At this season of the year the prevailing winds in the western part of the Gulf of Mexico are from the southward and eastward; that is, towards the great centre of rarefaction. At this season of the year, too, the prevailing winds in the Pacific, off the coasts of Central America, are from the southward, and also towards the same centre of heated plains and ascending columns of air; and we have seen that off the coasts of California, between the parallels of 35° and 40° N., the prevailing winds of this season are from the northward and westward; also towards this

great inland "blow hole." In it is seated a monsoon agent, whose influence is felt for more than a thousand miles out to sea, drawing back the N.E. trades of the Pacific, and converting them into a southwardly monsoon for half a year; deflecting the N.E. trades of the Gulf of Mexico, and converting them into a south-easterly monsoon during the same season, and so influencing the prevailing S.W. winds off our N.W. Pacific coast that they, too, are almost made to blow a north-westerly monsoon.

Therefore vessels bound to San Francisco should not, unless forced by adverse winds, go any farther beyond the meridian of 130° W. than they can help. Supposing that vessels generally will be able to reach 30° N. without crossing the meridian of 130° W., the distance per great circle from Cape Horn to its point of intersection with that parallel is about 6,000 miles.

And supposing, moreover, that California-bound vessels will generally, after doubling Cape Horn, be able to cross the parallel of 50° S., between the meridians of 80° and 100° W., their shortest distance in miles thence to 30° N., at its intersection with the meridian of 130° W., would be to cross 40° S. in about 100° W.; 30° S. in about 104° ; 20° S. in about 109° ; the Equator in about 117° W.; and 30° N. in about 130° W. (126° if you can). By crossing the line 10° farther to the East, or 10° farther to the West of 117° , the great circle distance from Cape Horn to the intersection of 30° N. with 130° W., will be increased only about 150 miles.

Navigators appear to think that the turning point on a California voyage is the place of crossing the Equator in the Pacific. But the crossing which may give the shortest run thence to California may not be the crossing which it is most easy to make from the United States or Europe; and it is my wish to give in these sailing directions the routes which, on the average, will afford the shortest passage to vessels that have doubled Cape Horn; and then, by comparing the two, we may be able to lay down the best route from Cape Horn to California.

There are 87 crossings between 115° and 120° W., which have been analysed. They give the shortest average time to San Francisco; their average, however, is only 16 hours (0.6 day) less than the average from the crossing between 110° and 115° , and the average to the latter crossing from 50° S. is 8 hours (0.3 day) shorter than the average to the former crossing. Hence we conclude from a total of 441 passages from the line, of 448 to the line, that the average passage from 50° S. to San Francisco is 53.5 days via the crossing between 115° and 120° W., and 53.8 days via the crossing between 110° and 115° . Thus, in the long run, the crossing between 115° and 120° gives the best average, but is not so much frequented as that between 110° and 115° , the numbers being respectively 103 and 220.

A long series of tables, derived from the voyages quoted, is given by Capt. Maury in elucidation of the subject, which are very interesting. We give some of his concluding remarks on the discussion of these tables.

PASSAGES.

The shortest monthly means are 104 and 116 days, and these are for the vessels that crossed the Equator in the Pacific during the months of January and December. And to this crossing they had an average run of 96 and 98 days. Vessels that sail from the United States to California in all of September and October are the vessels which, upon an average, should have the fairest winds and make the best passages.

It is of some consequence, in deciding as to the best crossing place on the Equator, that the navigator should have an idea as to the parallels near which he may expect to lose the S.E. trades; for the equatorial limits of these winds change with the season.

In March you will occasionally carry them several degrees over into the northern hemisphere. But in this month they are generally near the verge of their extreme declination towards the South. When you lose them and get the N.E. trades, keep away with a good rap-full, never aiming to cross the parallel of 20° N. to the East of long. 125° W. Unless the winds force you off, aim to be inshore of the meridian of 130° W. when you lose the N.E. trades.

When you do lose them, if then you have to fight the calms and baffling winds of the horse latitudes, make the best of your way on a due North course, till you cross this belt of calms, or catch a good wind, or get into the variables beyond.

In April you will carry these trades a little farther North, and so on farther and farther until October, when their northern edge becomes stationary and commences to return South. It reaches its farthest parallel of southern declination in March or April.

It appears from the summing up that the average passage to California for all classes of ships that used the charts and crossed the Equator between 105° and 120° is, the year round, 130 days. When these investigations commenced, the average passage the year round of all classes of ships, from the Atlantic ports of the United States to California was 180 days.

Indeed, it may now be considered as reduced to 128 days, for that is the average of the 87 vessels that crossed between the meridians of 115° and 120° W., which these investigations have shown to be the best crossing place. Indeed, the average of the 220 vessels that have crossed between 110° and 115° W., taken with the 87 that have crossed between 115° and 120° , makes the average rather less than 129 days.

The average passage of upwards of 300 vessels that have crossed between 110° and 120° is 128.9 days. There is no reason why all vessels should not cross the Equator between these two meridians, and hence we may consider it as an established fact, that the average length of the sailing voyage from Europe or the Atlantic ports of the United States is less than 130 days.

The vessels that sail in the spring have, in the aggregate, an average passage

ten days longer than those which sail at other seasons, the spring average being 137 against 127 days for the rest of the year.

The average crossing place of 50° S., in the Pacific, is about 82° W. Winds are sometimes, though not often, fair for making westing on the polar side of 50° S. When they are so, the skilful navigator will not fail to take advantage of them to gain a still more westerly crossing of this parallel.

In urging upon California-bound vessels the importance of making westing about the parallel of 50° S., I do not mean that they should expose themselves to heavy weather, or contend against adverse circumstances. I simply mean that if a vessel, after doubling the Cape, can steer a W.N.W. course as well as a N.W., or a N.W. as well as a N.N.W., or a N.N.W. as well as a North course, that she should on all such occasions give preference to the course that has most westing in it, provided that she does not cross 50° S. to the West of 100° or thereabouts, nor 30° S. to the westward of 115° , nor enter the S.E. trade-wind region to the West of the last-named meridian. This is the western route. It is so called because it requires you to keep as far West, within certain limits, as you well may without running broad off to make westing, or without fighting with head winds, or baffling winds, or calms, to get West.

The western route from Cape Horn to California is, as a route, to be preferred by all vessels at all seasons.

The farther from the land, the more regular and steady the wind, may be safely taken as a general rule.

Capt. Sherard Osborn, R.N., says:—Supposing a vessel bound to San Blas or Mazatlan, on the western coast of Mexico, and running before the southerly gale, which almost constantly blows along the shores of South America, she ought to shape a course so as to cross the Equator in about 98° or 99° W., so that, when she gets the N.E. trade, she will be at least 6° or 7° to the eastward of the meridian of her port, and have, at the same time, a sufficient offing from the Galapagos Islands to avoid their currents and variable winds.

We crossed in long. 105° W., having been recommended to do so by some old merchants at Valparaiso, and were consequently, although a remarkably fast-sailing ship, a lamentably long time in making the distance. Several days' log of the ship shows as follows:—March 24th, 1848, San Blas, 672 miles distant; 25th, 646 miles distant; 26th, 637 miles distant. Our track led us to be exactly in the same longitude as our port; when we got the trade, and it hanging well to the northward, we were constantly increasing our distance until in the latitude of San Blas, when an inshore tack of course shortened it. But by the course I have recommended, the first of the N.E. trades will drive the vessel into the meridian of her port, and she will thus daily decrease her distance.

Care must be taken when standing in for the land not to go to leeward of San Blas, as there is a strong southerly current along the coast, especially off Cape Corrientes.

Vessels bound to Acapulco, Istapa, or Realejo, should cross the Equator more to the eastward. It will be advantageous to cross it between 86° and 88° W. if bound for one of the eastern ports of the Mexican coast, or about 98° W. if bound to one of the western.

A vessel making the passages northward from San Blas had better make an inshore tack, until she reaches the latitude of, or sights Cape San Lucas, as she will there get the true wind, which blows almost without intermission along the line of coast from the northward. A West, or may be *South* of West course, will only be first made good, but as the offing is obtained, the wind will be found to veer a little to the eastward. However, it will always be the object to make headway, and get out of the tropic without any reference to the longitude, as a strong N.W. wind will soon, in lat. 25° or 28° , run off the distance, provided you have sufficient northing.

The attempt to beat up inshore amounts to perfect folly, if it does not deserve a worse name, a strong current accompanying the wind; and the latter must be taken into consideration, when running into your port with westerly winds.

Should a vessel be bound to California direct, I would cross the Equator in the Pacific Ocean in about long. 100° W.; cross the N.E. trade with a top-mast studding-sail set, and thus pass into the limit of the westerly winds, about 300 miles to windward of the Sandwich Islands; and once in them, take good care to keep to the northward of my port, for, as you approach the shore, the wind will draw round North, and the current to the southward increase.

San Francisco to Cape Horn.—First proceed as on the voyage to Callao (see page 1253), and after standing well full on the port tack, through the S.E. trade, steer South until the region of westerly winds is reached, between 35° and 40° S. Then bear away round Cape Horn on a great circle route.

These remarks, and the illustrative chart of the passages, will serve to elucidate these routes. Vessels have also reached California from Europe quickly by way of the Cape of Good Hope and Australia, as shown hereafter.

Mr. Davidson, U.S.N., in his excellent directions for the western coast of the United States, gives the following statistics of the voyages made to and from San Francisco, which will be interesting; but from the improvement in the sailing powers of ships of late years, the average duration of the voyages has become correspondingly shortened.

The number of clippers arriving at San Francisco from New York during the 10 years, 1850 to 1859, was 663, and the average length of the passage was 135.7 days. In the same years 373 arrived from Boston, and the average passage was 136 days.

In 1850 six clippers arrived from New York averaging only 115 days; the *Sea Witch* being reported at 97 days, but her actual passage was 101. The average passage of all American vessels that arrived from Atlantic ports was 187 days.

In 1851 only two clippers made the passage in less than 100 days—the *Surprise* in 96, and the *Flying Cloud* in 90, both from New York.

In 1852 the *Flying Fish* made it in 98 days from Boston, and the *Sword Fish* in 93 from New York.

In 1853 it was made by the *Contest* in 97 days, *Flying Fish* in 92, *John Gilpin* in 93, and the *Oriental* reported 100; all from New York.

In 1854 the passage was made by the *David Brown* in 98 days, the *Flying Cloud* in 89, the *Hurricane* in 99, the *Witchcraft* in 97, from New York; and by the *Romance of the Seas* in 96 days from Boston.

In 1855 no vessel made it in 100 days, although the *Herald of the Morning* and *Neptune's Car* reported in 100 from New York, and the *Westward Ho* in 100 from Boston.

In 1856 the *Antelope* made it in 97 days, and the *Sweepstakes* in 94 from New York.

In 1857 the *Flying Dragon* arrived in 98 days, and the *Great Republic* in 92 from New York. The Danish clipper *Cimbar* made the trip from Liverpool in 106 days, the quickest on record.

In 1858 the ship *Twilight* made the passage in 100 days, and the *Andrew Jackson* in 99 days from New York.

In 1859 no vessel made the passage in 100 days. The *Andrew Jackson* made the shortest trip in 102 days from New York.

In 1860 the ship *Sierra Nevada* made the passage from Boston in 97½ days, and the *Andrew Jackson* from New York in 90½ days.

The shortest passage made from New York to San Francisco by steam-ship, via the Isthmus of Panama, was by the *Moses Taylor*, on the eastern side, and the *Golden Age* on the western, their actual running time 19 days 23 hours; total time from dock to wharf 21 days, 2 hours, 13 minutes, arriving at San Francisco February 26, 1858.

The clipper *Northern Light*, of Boston, is reported to have made the run from San Francisco to New York, in ballast, in 75½ days, and the *Trade Wind*, with cargo, in 84 days. The average time of passage is about 100 days.

The average length of passages from other prominent ports is given for the years 1857, 1858, and 1859.

From China 32 vessels arrived in 1857, averaging 59 days, the quickest trip from Shanghai being 34 days, by the tern *Spray*, and from Hong Kong in 35 days, by the schooner *Giulietta*.

In 1858, 28 vessels arrived, averaging 53 days, and in 1859, 28 vessels, averaging 54½ days.

From Honolulu 19 vessels arrived in 1857, averaging 19½ days, the shortest trip being made by the barque *Yankee*, in 13 days.

In 1858, 25 vessels arrived, averaging 15 days, the shortest trip being made by the barque *Yankee*, in 11 days. In 1859, 20 vessels arrived, averaging 20 days, the shortest passage being by the barque *Oncard*, in 10 days.

North Pacific.

PASSAGES.

For a period of five years ending August 1, 1859, a record was kept of 427 passages between San Francisco and Honolulu. The average time of 224 passages from San Francisco to Honolulu was 16½ days, four being made in 9½ days each. The average time of 203 passages from Honolulu to San Francisco was 23 days, three being made in 11 days each.

From Valparaiso 17 vessels arrived in 1857, averaging 54 days, the shortest passage being made by the Danish ship *Veler*, in 37 days. In 1858, 16 vessels arrived, averaging 73 days.

From Australia 13 vessels arrived in 1857, averaging 81½ days out, the shortest passage by the topsail schooner *Vaquero*, in 57 days. In 1858, 14 vessels arrived, averaging 80 days, the shortest passage being made by the *Vaquero*, in 64 days. In 1859, 27 vessels arrived, averaging 76 days.

BETWEEN CALIFORNIA AND AUSTRALIA, ETC.

Captain May says: The great circle distance from South Australia to California is about 7,000 miles, and vessels in the direct trade between Australia and the Pacific coasts may have the choice of routes going as well as coming, going the distance to be sailed, on account of detour for the sake of winds, is about 7,500 miles, returning, that is, coming this way by the eastern route, the distance is 8,000 miles, and going the other way. With the exception of the N.E. trade in the passage from New South Wales or Victoria to California, the passage from California may conveniently be made fair both ways. A good N.E. course may be taken through the S.E. trades, and a N.N.W. course, on the average, through the N.E. trades. But these courses will not give casting enough on the California bound trader, and it therefore becomes a question of the N.E. trade in the variables North of the N.E. trades, for in both of these seasons of variable westerly winds prevail.

On the passage from South Australia, a stick her close to the eastward, and take the nearest wind. On the passage you should run down your casting pretty well, but you get far enough to be bothered by the baffling winds of the N.E. trade. If these come as low down as 30° or 40° S., stand North, the moment you feel them till you get the S.E. trades; then cross these with the N.E. trades, and obliquely to the eastward as they will permit, with the topsail-trading sail set.

On the passage you will have finally to run down your casting when you get past the N.E. trade, beyond the N.E. trade, and of course you will aim to reach the point of 10° N., or even a higher one North, to do this. How far you will go North depends somewhat on the distance you may be West of California when you leave the N.E. trades. If you be only a degree or two from the land, you will steer straight to your port without caring to

get to the northward of it; but if you be 10 or 20 degrees to the West of it, or even farther, then of course the distance to be run makes it an object to turn out of your way and go North in search of good winds.

Therefore, the choice of routes on this voyage resolves itself into the answer to this question: Is it best to making easting between the parallels of 40° and 50° S., or about the parallel of 40° N.? If the former, then the eastern route is the route; if the latter, then the preference should be given to the western route.

I give preference to the eastern route, especially and decidedly when the winds at starting are favourable for the East course. I have no doubt that, as a general rule, the winds by the eastern route, both variables and S.E. trades, are much more steady and reliable than they are by the western route. Moreover, the distance from the Victoria ports, via the South side of Van Diemen's Land and New Zealand, is not more than 300 or 400 miles greater than it is by the most direct route that is practicable, and the chances of good winds by the eastern route will, in my opinion, amply make up for this increased distance.

It is proper for me to state here that I do not give these Australian sailing directions as directions that are founded on, or derived from, investigations into the routes actually pursued by vessels from Australia to California; but I give them as deductions drawn from the knowledge which I have acquired touching the general system of the winds and currents out upon the high seas.

The most difficult and uncertain parts of this passage will be in the time required to cross the three belts of calms, and to clear the winter fogs of California. But for these the eastern passage from Victoria to California would be one of the most certain passages in the world.

The distance from Victoria to California cannot be accomplished under canvas, by the eastern route, much short of 8,700 miles. But driving captains, with clipper ships under them, may expect to average, one trip with another, along this route, not far from 200 miles per day. The clipper rate from Victoria to Cape Horn will probably be upwards of 200 miles a day; for I feel assured that there is no part of the ocean in which the winds generally will admit of more heavy dragging and constant driving than they will in the extra-tropical regions generally of the South Pacific, say on the polar side of 43° S.

Route from California to Australia. the route out of San Francisco should be down as soon as possible into the N.E. trades, as though you were bound to China, India, or the Sandwich Islands, crossing the Equator anywhere between the meridians of 140° and 150° W., according as you prefer to run down your westing principally in the N.E. or S.E. trades. I give the preference to the latter generally, because they are more steady, reliable, and certain, than are their congeners of the northern hemisphere—at least, such is the rule. The distance by this route to Bass Straits will be about 7,500 miles; and an increase upon this of the average distance to be sailed on the passage going, together

with the distance returning, will not amount, as before stated, to more than 600 or 800 miles.

"To avoid the calms as much as possible, from January to July, cross 10° N. at 143° W., and the Equator at 148° W. In July, August, and September, cross 10° N. at 148° W., and the Equator between 150° and 153° W. From October to January cross 10° N. at 138° W., and the Equator at 143° W. At all seasons cross 10° S. near 154° or 156° W."—*M. Labrosse*.

Aim to cross 30° S., on the passage from California to Australia, in the neighbourhood of 170° E. Thence the course is between Australia and New Zealand, direct for your port.

The passage between Australia and California should be made ordinarily in from 45 to 50 days; the passage to the East being rather the shorter, of course clipper ships will occasionally make the passage in 37 days.

In July, 1876, the ship *Wardale* left Liverpool, and made the voyage to San Francisco, *via the Cape of Good Hope*, in 136 days, although the distance is from 5,000 to 8,000 miles longer than by Cape Horn. In May, 1881, the ship *MacMillan*, Capt. Gray, left Antwerp, and reached San Diego in 128 days by the Cape of Good Hope, or in 3 days less than the *Jupiter*, which left Cuxhaven 4 days after the *MacMillan* left Antwerp, and went round Cape Horn, crossing the Equator in the Pacific in 117° W.

The *MacMillan* went through Bass Strait, past North Cape (New Zealand), Sunday and Penrhyn Islands, crossing the Equator in 153° W., 10° N. in 150° W., 20° N. in $152^{\circ} 12'$ W., and 30° N. in $148^{\circ} 6'$ W.

On April 28, 1876, the ship *Min-y-Don*, Capt. Leslie, cleared Sydney Heads, and reached San Francisco in 46 days. On leaving a West course was run past North Cape, New Zealand, and then, gradually turning northward, passed westward of Rarotonga, crossing 20° S. in about 163° W., and 10° S. in $157\frac{1}{2}^{\circ}$ W. The Equator was crossed in about 157° W., and 11° N. in $152\frac{1}{2}^{\circ}$ W. Thence the course was continued to the northward, passing eastward of and near Hawaii, crossing $31\frac{1}{2}^{\circ}$ N. in about $149\frac{1}{2}^{\circ}$ W., and 38° N. in 136° W., when an easterly course was made for San Francisco.—*Nautical Magazine*, May, 1884, pp. 356, 358.

BETWEEN CALIFORNIA AND CHINA.

In the passages along the American coast we shall allude to a system of navigation almost exclusively governed by local causes, and which, so far, are in reality not restricted to the shortest distance between the respective places. In getting beyond the verge of the trade winds, and in laying a track which embraces so many degrees of longitude as the distances between the above countries, it becomes another matter which is the shortest as well as the best course to pursue. As we have elsewhere described in the passage between Australia and the southern part of America, the great circle course becomes fully developed.

In the voyage from East to West, of course the readiest method is to gain the parallels of the trade winds as soon as convenient, and by these means run down the westing, which in this case brings the ship to her destination.

But the return voyage is another matter, and the probably best track leads into very different regions. Thus the rhumb course from the Bashee Channel, between Formosa and the Philippine Islands, to San Francisco, is about E. 9° N.; but the great circle course, from the same point, runs first N. 46° E., so that it touches the eastern part of the Meiao-sima Islands, inside or to the West of the Loo-choo Islands, and then cuts the S.E. cape of Nipon. Farther eastward it attains the latitude of 48° N., longitude 169° W., and then proceeds East and E.S.E. towards San Francisco; so that San Francisco bears N.E. $\frac{3}{4}$ E., true, from Hong Kong, and Hong Kong bears N.W. $\frac{1}{4}$ N. from San Francisco.

It will be very readily comprehended that a track so widely differing from the rhumb bearing of E. $\frac{1}{2}$ N., allows a wide range of choice for improving the passage, so that a ship immediately on getting off the China coast may bear at once to the northward, and, availing herself of the S.W. winds which predominate to the northward, may also be assisted by the Kuro Siwo, the strong north-easterly current setting along the outer coast of the Japanese Archipelago, and probably extending its influence nearly to the American coast.

It is also a question whether it would not be advantageous to make the first portion of the passage inside the Japanese islands, and enter the North Pacific by the Strait of Tsugar or Sangar; as the most direct track is not very far distant from such a course, and cannot be by any means lengthened by pursuing it.

This single instance will serve to direct attention to the wide variation that the great circle course is from that ordinarily pursued. And by specially applying its principles to any other points on the western coast of America, and the ports on the opposite side of the Pacific, it will be manifest that a very great range of ocean is left open to the navigator.

All vessels, Maury states, going West from California will stand to the south-westward for the N.E. trades. In summer and autumn they need not go as far South for steady trades as they do in winter and spring.

M. Labrosse advises vessels to reach the N.E. trades as soon as possible. Then run to the West on a parallel not too near the northern limit of the trade winds, thus avoiding the "horse latitudes." To do this, choose some parallel between 20° and 15° N. keeping near 20° N. between June and October, and near 15° between December and March. At all seasons pass South of the Sandwich Islands and North of the Marshall group.

From May to October, in the S.W. monsoon, keep northward of the Caroline Islands and southward of the Marianas, and afterward steer for the Strait of San Bernardino, with the N.E. winds, and enter the China Sea between Luzon and Mindoro. From October to April, in the N.E. monsoon, run North of the Marianas, and enter the China Sea by the Bashee Channel.

The route from Yokohama to San Francisco is an easy passage. The westerly winds will be found near 40° N., and the current is favourable. Vessels should follow a great circle route as nearly as possible, though it is not advisable to pass 48° N. from April to September, nor 44° and 45° from October to March. Fogs are prevalent on the Californian coast, especially from April to November.

Mr. George Davidson makes the following remarks on this passage, in the U.S. Coast Survey Report, 1867:—"The currents, their effects upon the weather, and the prevailing westerly winds, will decide the question against the Great Circle Route between San Francisco and Yokohama, or even Hakodadi. Observation has demonstrated the almost continuous state of foggy and thick weather, resulting from the meeting of the cold water of the Behring Sea Current with the northern edge of the great Japan Stream flowing eastward. The experience of the SS. *Colorado* on her first voyage from Yokohama to San Francisco, in attempting to run along this great circle route, was so fearful as to deter the vessels of the line again attempting the northern passage.

"A vessel, making the great circle track to the eastward, would have the great Japan Stream in her favour to about lat. 43°, long. 156° E.; then the cold Behring Sea Current and the end of the Alaska Current to lat. 47°, long. 157° W.; finally to San Francisco, passing through the great bend of the Japan Stream, where the weather is almost invariably thick and bad in summer, and cold and boisterous in winter. The westward trip would have heavy adverse winds nearly the whole distance; large sea and adverse currents for two-thirds the distance.

"The commercial advantages of the steam route to China, through the warmer and more equable latitudes, must always outweigh any merely theoretical and shorter but more hazardous route. From the South end of Japan to San Francisco, a course very little North of a direct line on a Mercator projection carries a vessel across the great Japan Stream, in part through the axis of the main branch flowing eastward, across the northern part of Fleurieu's whirlpool, and across the California Stream, with favourable or light winds the greater part of the distance. In returning, the course should be to the northward of the direct course, taking advantage of the California Stream and favourable N.W. winds, and entering the upper limit of the waters moving westward to the longitude of the Sandwich Islands, to form part of the great Northern Equatorial Current, thence westward, through variable and feeble currents, until the upper limits of the western part of the Equatorial Current are entered."

BETWEEN CALIFORNIA AND PANAMA.

Captain Maury referring to the data he had collected, says:—After carefully studying this description of the winds, derived, it is true, from no great abundance of materials, I have to suggest the following routes for the consideration of navigators bound N.W. from Panama.

From the Bay of Panama make the best of your way South until you get between 5° N. and the Equator.

Being between these two parallels, it will be for the navigator to decide whether he will shape his course West, and keep between them until he crosses the meridian of 85° W., or whether he will cross the Equator, and make his westing in South latitude, with the S.E. trades on his quarter. The winds that he finds between 5° and the line should decide this question for him. If he can get West here with a good breeze he should crack on, and when his good wind leaves him, steer South again.

If the passage from Panama be attempted in January, February, March, April, May, or June, time will probably be saved by going South of the Equator; for, at this half of the year, the N.E. trades and the equatorial doldrums are often found between the Equator and 5° N. Between the meridians of 80° and 85° W., in this part of the ocean, these winds and calms are found even in the months of July and August. Therefore, in coming out of Panama, and after crossing 5° N., in any season, make a S.W. course if the winds will allow. If the wind be S.W., brace up on the starboard tack; but if it be S.S.W., stand West, if it be a good working breeze. But if it be light and baffling, with rain, know that you are in the doldrums, and the quickest way to clear them is by making all you can on a due South course.

Suppose that after crossing 5° N. you have got to the West of 85° without having crossed the Equator. Now, if the time of the year be in that half which embraces July and December, the prevailing winds will be between S.E. and South, inclusive, and the course is West as long as there is a breeze. As soon as the breeze dies away, and you begin to fight the baffling airs, conclude that you are in the vicinity of the doldrums that are often found here either between the N.E. and S.E. trades, or between one of these trades and the system of southwardly monsoons that blow North of the line, and between the coast and the meridian of 95° W.

These belts of doldrums lie East and West, and the shortest way to cross them is by a due North and South line; therefore let it be a rule, whenever the navigator finds himself in one of these calm belts, to make all the latitude possible, for by that means he will soonest clear it.

Having crossed the meridian of 95° , stand away to the northward and westward with a free wind.

West of longitude 100° , and between the parallels of 5° and 10° N., the

winds, in the months of November and December, are variable between N.E. and South, by way of East. In January, February, and March, they are quite steady as N.E. trades. In April they are variable. The doldrums are generally found between those parallels in this month. During the rest of the year the winds are all the time between S.E. and S.W.

It will be well to cross the parallel of 10° N. at least as far West as the meridians of 105° or 110° W. Here, between the parallels 5° and 10° N., the winds in November are steady from S.S.E. and South; December, April, and May, are the months for the doldrums in this part of the ocean.

Having crossed the parallel of 10° N., between 105° and 110° , the navigator is then in the fair way to California.

In making the West coasts of Mexico and the United States, the kelp is said to form an excellent landmark. This weed is very long and grows on the rocks at the bottom. When, therefore, in approaching the coast, you come across lines or swarths of tangled kelp, its being tangled or matted is a sign that it is adrift. It is afloat in deep water, and you may sail boldly through it without fear. But when you come across it tailing out straight, it is then fast to the rocks at the bottom, and it is dangerous to get among it.

Vessels with steam power should steam whenever necessary after leaving Panama, and aim to cross the line near 85° W. Thence the route lies either to northward or southward of the Galapagos, according to the season. The remainder of the voyage can be easily made under canvas.—*M. Labrosse.*

Vessels from San Francisco intending to touch at Panama or any of the ports South should stand out well from the Mexican coast. Information as to the best route for these passages is wanting. But I should, with such information as I at present have with regard to this navigation, feel disposed, were I bound from San Francisco to Panama, to steer straight for the line somewhere about 104° W., and stand on South until I could, with the S.E. trades, run in on the starboard tack for the land.

San Francisco to Panama.—From May to October stand well out to sea with fair N.W. winds, and steer to cross 20° N. near 118° or 120° W., and then head South or S.S.E. Southward of 10° N. settled S.E. trades will be found; here haul up on the port tack, and stand on until sure of reaching Panama on the starboard tack, when go about. The Galapagos Islands can be passed to the northward, and 90° W. near 4° N.

From November to April the winds to 20° N. are generally favourable, from N.E. to N.W.; 10° N. can be crossed at 110° W. When the N.E. trades begin to grow light, steer South for the S.E. trades, with which stand on, on the port tack, until certain of fetching southward of the Galapagos on the starboard tack.—*M. Labrosse.*

In addition to this may be quoted a letter to Captain Maury from Captain Bloomfield, a gentleman of twenty-five years' experience on that coast:—

“Your own experience will have shown you that from December to April

are the summer months or dry season; the northerly wind prevailing more or less during the major part of the time, it being the strongest about January and February, gradually taking off until about the middle of April, when the winter months are supposed to commence, from May to August, when rains, thunder, and lightning, with nearly daily thunder squalls intervene, causing the winds to be as changeable during the twenty-four hours as often as there are hours in the day.

"From August to December the weather becomes somewhat settled, and commencing lightly with a southerly wind, in October and November, I have seen it blow a moderate gale home to Panama anchorage, inasmuch as to cause the merchant vessels to have two anchors down. The sea also becomes somewhat rough, requiring more than ordinary care in landing in boats. It is accompanied sometimes with squalls and intermissions, but, generally speaking, with cloudy but dry weather. I have at times experienced some very clear nights and days during this season.

"In leaving Panama it is easy to be done in either the summer, or when the northerly winds prevail, or from August to December, when you generally have a southerly wind, which will enable you either to sail or work out of the bay.

"The starboard or western in-shore should be kept on board by a sailing vessel on leaving, and the eastern side inside the Pearl Islands on entering, except if you are entering about the months of September, October, and November, when in all probability you would bring a strong southerly wind; but during the prevalence of the northerly and light winds, the eastern passage is beyond doubt to be preferred.

"If bound South, in passing Point Mala within 3 or 4 miles, the greatest object is to get to the westward in 81° or $81^{\circ} 30'$, in order to avoid the strong current, rains, and light winds which prevail nearly all the seasons of the year to the eastward of it, about the environs of Buena Ventura. In passing Point Mala, either with a northerly or southerly wind, make your westing as soon as you can; and by getting into the longitude above named, it will enable you to reach the southerly winds sooner, either to enable you to make your westing up, if bound to the northward, to long. 110° to 114° W., or to work to the southward, taking advantage of every change, until the latitude of Plata is reached, when the shore can be approached to take advantage of the land winds, if taking the in-shore passage, or it will enable you to stand to the S.W. if taking the off-shore passage.

"In working to the southward, after leaving Point Mala with a southerly wind, do not be tempted, when on the starboard tack, to stand to the S.E. and S.S.E. too long, as the current about 140 miles to the South of Point Mala runs constantly to the eastward. On some occasions I have known it set—in fact, I have been set—35 miles in 24 hours, ascertained by good chronometer,

North Pacific.

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PASSAGES.

and confirmed by making the land. Therefore it is always advisable to hold on your westing, even if you should make northing in doing so, and comparatively little difficulty will be attended in reaching the southerly winds, which range to different latitudes during the 12 months; as a rule—

"From April, to 1° North; from May, to 2° North; from June, to 3° North; from July, to 5° North; from August, to 6° North; from September, to 7° 30' North; from October, to Panama anchorage; from November, to 7° North; from December, to 5° North; from January, to 3° North; from February, to 2° North; from March to 1° North.

"Therefore after reaching the outer verge of the southerly wind, the next object, more particularly if bound to the westward, is to be certain that you entered it far enough, so as to reap the whole benefit of its strength, which you will find to be equally different in its position as the southerly wind in reaching its northern limit; but, generally speaking, when the northerly winds do not prevail from off Point Mala to its southerly wind limits, it prevails from S.W. to N.W."

Mr. Hull, R.N., of H.M.S. *Harannah*, says:—

"Lieutenant Maury truly says, 'that the passage under canvas from Panama to California, as at present made, is one of the most tedious, uncertain, and vexatious that is known to navigators.'

"The best way to avoid these difficulties seems to be by making southing on leaving Panama; do not care about making westing, but push South; at this time of the year July and August you will probably meet the S.E. trade well over the line in 4 or 5° N.; then run to the westward till you reach the meridian of 110° W.; you may then cross over to the N.E. trade; keep well free. Ships generally make the best passages that have gone to the westward of 114°. On running in for the land, make Punta de los Reyes.

"These remarks are written partly from Lieutenant Maury, and partly from my own experience in these seas. In H.M.S. *Herald*, I made three passages, two from Panama and one from Port Burica, which is about 200 miles to the West; the first took us 32, the second 42, and the third 28 days; to get clear of the variables in the passages we pushed to the westward, keeping in about lat. 10° N. H.M.S. *Brisk* was 84 days from this port to San Francisco, and in 1849 and 1850 ships were commonly 80 days.

"On the other hand, H.M. brig *Swift*, by going to the southward, made the passage to Honolulu in 47 days, and one ship only made 45 days to California by adopting this plan.

"Again, the weather in the doldrums is most harassing—heavy rain, with squalls, thunder, and lightning; whereas by going South you have the fine S.E. trades."

Ships bound from San Francisco to Mazatlan or San Blas will, at all seasons, have the wind and current favourable. Vessels bound to Acapulco, beyond Cape Corrientes are liable to be delayed by calms; but during the

winter, the chances of calms are less, and the descent of the coast can be made with more facility, even to Istapa and Realejo.

Some further remarks on the difficult navigation of the Gulf of Panama are given on pp. 1254—1255.

COAST OF CALIFORNIA, ETC.

From San Francisco to Vancouver Island.—From November to April, or during the bad season, commence by putting well out to sea. When far enough off to have nothing to fear from S.W. or N.W. squalls, make as much to the North as possible. Beyond the parallel of Cape Mendocino the S.W. winds prevail, enabling vessels to finish the voyage without difficulty. From April to November, or during the fine season, after leaving San Francisco run about 100 or 150 miles off shore, and then make to the northward.

“Although the distance between San Francisco and Vancouver is only about 700 miles, yet this is a tedious passage to make in a sailing ship, as the wind is generally dead foul, or from the N.N.W. We fortunately started on a calm day, and steamed close to the shore as far as Cape Mendocino (200 miles), where we fell in with the usual northerly winds, which obliged us to stand out to the westward about 260 miles, so as to make a fair wind on the other tack.—*Lieut. S. Eardley-Wilnot, H.M.S. Zealous, April, 1870.*

The following instructions are from the Report of the United States Surveyors:—Sailing vessels bound northward from Monterey, or any more northern port during the summer season, should stand well off shore, not too close-hauled, until about 200 miles from the land, when they will be beyond the influence of the southerly current, and in a situation to take advantage of a slant of wind which frequently occurs from the W.N.W. They would do well not to approach the land, unless the winds enable them to lay their course, or nearly so, until up with the latitude of the destined port.

Steamers should follow the coast from point to point as nearly as possible, always keeping within 15 miles of the land. They will by this means shorten the distance, and frequently avoid the strong N.W. wind, as they will often find it quite calm close in with the shore, when there is a wind to seaward.

Vessels bound to the northward in the winter season should keep as close along the land as practicable, and take every advantage of all southerly winds to make latitude. They should always endeavour to make the land at least 20 or 30 miles to the southward of the destined harbour.

If bound from Vancouver to the southward keep the coast in sight, and take advantage of either tack upon which the most latitude may be made, always making the land to the northward of the port in summer, and to the southward in the winter season.

Bound to San Francisco or Monterey, use every opportunity to observe for

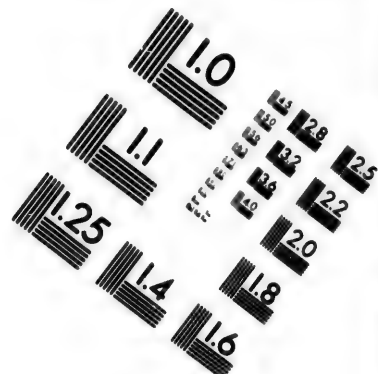
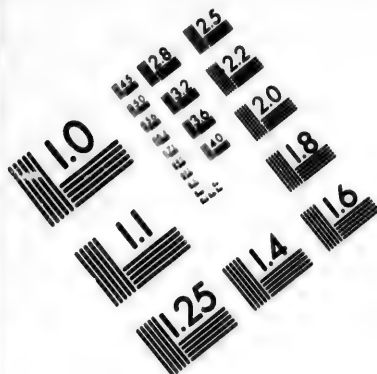
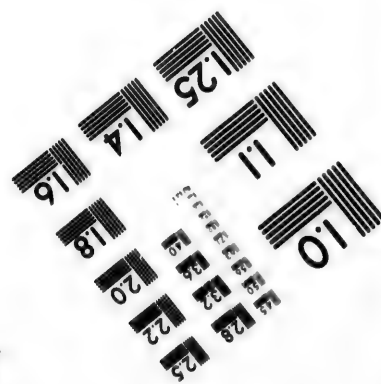
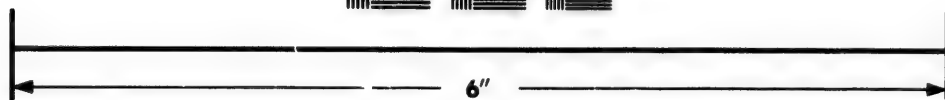
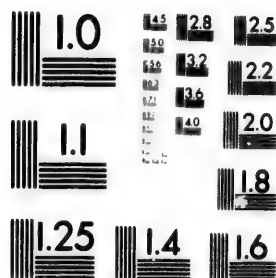


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and confirmed by making the land. Therefore it is always advisable to hold on your westing, even if you should make nothing in doing so, and comparatively little difficulty will be attended in reaching the southerly winds, which range to different latitudes during the 12 months; as a rule—

" From April, to 1° North; from May, to 2° North; from June, to 3° North; from July, to 5° North; from August, to 6° North; from September, to 7° 30' North; from October, to Panama anchorage; from November, to 7° North; from December, to 5° North; from January, to 3° North; from February, to 2° North; from March to 1° North.

" Therefore after reaching the outer verge of the southerly wind, the next object, more particularly if bound to the westward, is to be certain that you entered it far enough, so as to reap the whole benefit of its strength, which you will find to be equally different in its position as the southerly wind in reaching its northern limit; but, generally speaking, when the northerly winds do not prevail from off Point Mala to its (southerly wind) limits, it prevails from S.W. to N.W."

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“ Although the distance between San Francisco and Vancouver is only about 700 miles, yet this is a tedious passage to make in a sailing ship, as the wind is generally dead foul, or from the N.N.W. We fortunately started on a calm day, and steamed close to the shore as far as Cape Mendocino (200 miles), where we fell in with the usual northerly winds, which obliged us to stand out to the westward about 250 miles, so as to make a fair wind on the other tack.—*Lieut. S. Eardley-Wilmot, H.M.S. Zealous, April, 1870.*

The following instructions are from the Report of the United States Surveyors:—Sailing vessels bound northward from Monterey, or any more northern port during the summer season, should stand well off shore, not too close-hauled, until about 200 miles from the land, when they will be beyond the influence of the southerly current, and in a situation to take advantage of a slant of wind which frequently occurs from the W.N.W. They would do well not to approach the land, unless the winds enable them to lay their course, or nearly so, until up with the latitude of the destined port.

Steamers should follow the coast from point to point as nearly as possible, always keeping within 15 miles of the land. They will by this means shorten the distance, and frequently avoid the strong N.W. wind, as they will often find it quite calm close in with the shore, when there is a wind to seaward.

Vessels bound to the northward in the winter season should keep as close along the land as practicable, and take every advantage of all southerly winds to make latitude. They should always endeavour to make the land at least 20 or 30 miles to the southward of the destined harbour.

If bound from Vancouver to the southward keep the coast in sight, and take advantage of either tack upon which the most latitude may be made, always making the land to the northward of the port in summer, and to the southward in the winter season.

Bound to San Francisco or Monterey, use every opportunity to observe for

latitude or longitude, so as to know the vessel's position up to the latest moment, as fogs and haze, preventing observations, prevail near the land. Allow generally for a southerly set of half a mile per hour, until within about 50 miles of the land; after which, at times, it is not appreciable. With these precautions vessels may steer boldly on, shaping a course for the South Farallon, an islet about 250 feet high and a mile long, having 14 fathoms water and good holding ground on the S.E. side; a lighthouse and fog signal are now established on this islet.

On approaching soundings the water becomes of a pale green colour. Soundings may be had in 60 to 40 fathoms, soft ooze, if approaching Point Reyes, on which a lighthouse and fog signal are established. Under 40 fathoms is near the land, and the surf should be heard, if haze prevents the land from being seen. If the soundings are 30 fathoms or under, and the sea smooth, anchor with a kedge until the land or the light becomes visible, so as to take a compass bearing, as the position cannot otherwise be relied on.

If up with the South Farallon and night approaching, or there are appearances of fog, anchor at the Farallon and wait till daylight, when the morning breeze will carry the vessel to the bar or pilot-ground.

Inside the Farallones the "set" is generally towards the North shore which may be approached without risk, keeping outside of the kelp, which marks rocks under water.

San Francisco to the Sandwich Islands.—First run for the trades, and from June to December steer about W.S.W. to clear the land as soon as possible, thus avoiding the calms to the eastward of 128° and 133° W. Near the Sandwich Islands the trades may possibly haul to East or S.E. The land should be approached from E.N.E.

Sandwich Islands to San Francisco, etc.—The passages from the Sandwich Islands to any part of the N.W. coast of America, are made by standing to the northward till the westerly winds are reached, when the run into the coast is easily made, taking care, however, if bound to a port to the southward of you, not to bear up till well in with the land, when north-westerly winds will be found to carry you down to the southward. From July to September the West wind may not be reached till lat. 44° or 45° N.

On this coast, as a general rule, the land should be made to the northward of the port you are bound to, as in almost all cases the wind and current both prevail from the northward from Vancouver Island to Cape Corrientes of Mexico.

San Francisco to Tahiti.—Run for the trades, and afterward head nearly as if bound for Valparaiso. Cross the Equator between 118° and 123° W. from May to October, and between 113° and 118° W. from October to May, and then run for the high lands of Fatu-hiva, afterwards passing through the Paumotu group towards Tahiti.

Tahiti to San Francisco.—Keep a clean-full and cross the Equator, if

possible, on the starboard tack, between 152° and 148° W. Run through the N.E. trades on the starboard tack, and after crossing 10° N. well to eastward, (near 148° W., in June to November), the starboard tack will fetch a ship to windward of the Sandwich Islands. If this cannot be done, pass well to leeward of the islands. Thence proceed as before described (p. 1252).

BETWEEN CALIFORNIA, ETC., AND PERU.

San Francisco to Callao.—Captain Maury says:—Most vessels on this voyage make a mistake, especially in summer and fall, in the passage across the belt of N.E. trades. Being anxious to get to the East, they edge along, aiming to lose those winds in 90° or 100° , as the case may be. There they encounter the southwardly monsoons in the Pacific off the American coast, similar to those along the African coast in the Atlantic. The vessels taking that course, and being so baffled, have now to make a sharp elbow and run off 8° or 10° , or even more degrees to the westward before they clear this belt of calms and monsoons and get the S.E. trades. Of course the voyage is greatly prolonged by this.

The route which, as at present advised, I would recommend, is, that navigators steer the same course from California that they would if bound to the United States, until they pass through the S.E. trades, and clear the calms of Capricorn. Therefore I say to the Chincha-bound trader, when you get your offing from the heads, steer South, aiming to cross the line *not to the East* of 115° , for the rule is, the further East the harder it is to cross the equatorial doldrums in the Pacific as well as it is in the Atlantic.

When you get the S.E. trades crack on with topmast studding-sail set, until you get the brave West winds on the polar side of the calms of Capricorn. Now turn sharp off from the route around Cape Horn, and run West until you bring your port to bear to the northward of N.E., when you may stick her away. Now, by this rule the Chincha-bound navigator may sometimes, before he gets these westerly winds, find himself as far South as 40° or 45° , and as far East as 120° or 125° . Let him not fear, but stand on until he gets the winds that will enable him to steer East, or until he intercepts the route from Australia to Callao, when he may, without fear of not fetching, take that.

In the summer and fall of the northern hemisphere (June to November) the calm belt of Capricorn will be cleared generally on the equatorial side of the parallel of 30° S.; at the other seasons you will have frequently to go 6° or 8° further.

M. Labrosse advises sailing vessels leaving San Francisco to endeavour to cross the Equator near 118° W. between May and October, and near 113° W. between October and May. Auxiliary steam-vessels taking the East route, will be enabled to cross 10° N. between 89° and 91° W., and will then experience variable winds till they reach Cape San Francisco. Steam

will have to be used about half the time in this locality. From Cape San Francisco to Callao the passage will be tedious, as both wind and current are from the southward.

Valparaiso and Callao to San Francisco.—On leaving steer to reach the S.E. trades, when the course should be shaped to cross the Equator as in the passage from Cape Horn (p. 1235).

CENTRAL AMERICA, MEXICO, ETC.

Our information as to the best means of making a passage along these coasts is still but scanty. The following observations, therefore, by Lieutenant-Commander James Wood, of H.M.S. *Pandora*, become exceedingly valuable. In a former page we have given the observations on the prevalent winds in this region by the same officer.

From the Southward to Panama Bay.—From what has been said of the winds which prevail within the first division (pp. 1170-2), it will be seen that the passage from the southward to Panama Bay is easily made during the greater part of the year; but in the fine season, when within the influence of the northers, the following plan should be adopted. Make short tacks in-shore, as there is generally a set to the northward found within a few miles of the land, and where that is interrupted, a regular tide is exchanged for a constantly contrary current further off. Between Chirambira Point and Cape Corrientes the land is low and faced with shoals, caused by the mouths of the numerous rivers which have their outlets on this part of the coast, but after passing Cape Corrientes, it may be approached pretty closely, except off Francisco Solano Point, where some shoal rocky patches extend to seaward, as the coast is in general bold-to. Care, however, should be taken not to run into the calms caused by the high lands, as it is difficult to get off into the breeze again, and the swell sets in-shore, where it frequently happens that no anchorage is to be found till close to the rocks.

In beating up the Bay of Panama in the fine season, the eastern passage, or that between the *Islas del Rey* and the main, is to be preferred, as, with one exception, it is free from dangers. The water is smooth, and a regular tide enables you to make more northing than it would be possible to do, in nine cases out of ten, against the strong current, and short high sea, which at this season prevail in the centre or on the western side. During the rainy season, a straight course up the bay is preferable to entangling yourself with the islands, the current generally following the direction of the wind.

From Panama Bay to the Southward.—But the great difficulty at all times consists in getting either to the southward or westward of Panama. The passage to the southward is made in two ways,—either by beating up the coast against a constantly foul wind and contrary current, or by standing off to sea till sufficient southing is made to allow you to fetch your port on the

starboard tack. Both plans are very tedious, as it frequently takes twenty days to beat up to Guayaquil, whilst six or seven days are an average passage down.

From Panama Bay to the Westward.—If bound to the westward during the northerly, a great deal of time may be saved by keeping close in-shore, and thus taking advantage of them; they will carry you as far as the Gulf of Nicoya. When past the Morro Hermosa, "Papagayos" may be looked for, and with them a course should be steered for the Gulf of Tehuantepec, when it will depend on the port you are bound to, whether, after crossing the gulf by the aid of one of its gales, you should keep in or off-shore. If bound for Acapulco, keep in and beat up; but if bound to the westward, you cannot do better than make a West course, as nearly as the winds will allow you.

The passage to the westward from Panama during the rainy season is a most tedious affair, calms, squalls, contrary winds and currents, accompanied by a heavy swell and extreme heat, as well as an atmosphere loaded with moisture and rain, are the daily accompaniments. It often occurs that 20 miles of westing are not made in a week, and it is only by the industrious use of every squall and slant of wind that the passage can be made at all.* Opinions are divided amongst the coasters as to the propriety of working to the southward and trying to get rid of the bad weather, or beating up within a moderate distance of the land. My experience would lead me to prefer the latter, as the strong winds and frequent squalls which so often occur near the land sometimes allow a good long leg to be made to the north-westward, while, further off, this advantage is sacrificed for only a shade finer weather.

From the Galapagos Islands to Cape St. Lucas.—I have already alluded to the difficulty of getting to the westward from the Bay of Panama. The trade wind seems to possess no steady influence to the eastward of a line drawn from Cape St. Lucas, in 22° N., to the Galapagos Islands on the Equator. Amongst these islands the south-eastern trade wind is steady during nine or ten months of the year, and it is only in January and February, and sometimes in March, that they are interrupted by long calms, and occasional breezes North and N.W., but these are never of any great strength. To the northward of them, the eastern limit of the trade seems to depend upon the time of year. In the early part of April I have found it between the parallels

* Of the tedious nature of this navigation, the following sad account will be a good example:—The barque *Amely*, from London, sailed from Panama for San Francisco on the 7th of March, 1852, and after being out sixty-five days put into San Blas, with nineteen of the passengers dead. The remaining passengers were then transferred to the *Archibald Grant*, and they were sixty-five days on the passage to San Francisco, during which time eighteen more of them died. The sufferings endured by the unfortunate passengers is almost beyond description. For the last thirteen days of the passage they were on an allowance of a pint of water per day, and totally without provisions.

of 8° and 13° N., 900 to 1,000 miles further to the eastward than at the end of June; and in the intermediate months, either more or less to the eastward as it was earlier or later in the season, but in no case that I have met with has a steady or regular trade been experienced till the above line has been reached. It is this circumstance, and the prevalence in the intermediate space of westerly winds, calms, and contrary currents, that makes the passage from Panama to the westward, as far as this line, so tedious. I have been forty days beating from the entrance of the bay in 80° W., to the eastern edge of the trade in 111° W., a distance of less than 2,000 miles, or on an average about 40 miles per day.

From the meridian of Cape St. Lucas Westward.—When once within the influence of the trade, a passage is easily made either to the southward, westward, or northward; but it must be borne in mind that the eastern verge of this seems, in these parts, to be influenced by the seasons. Thus, in June and July, I found it fresh from N.N.W., and even at times N.W., as far out as the meridian of 125° W., whereas in March and April it was light from N.N.E. to East and E.S.E., from our first meeting it in 98° W., till past the meridian of Cape St. Lucas in 110° W., where I picked up a good steady breeze from N.N.E.

As a general rule the wind is found to haul more to the eastward as you get farther off the land, and I did not find this rule affected by the latitude, as, (although, as I have stated, the wind hangs to the northward, and even at times to the westward of North, near the eastern limit of the trade, from the tropic of Cancer to the variables near the Equator), I found it about the meridian of the Sandwich Islands as far to the eastward on and near the line as it was in 35° N., in which latitude the westerly winds are in general met with.

Capt. Basil Hall says:—The return passages from the coast of Mexico to Panama are always easy. From December to May (summer) a distance of 90 to 150 miles from the coast insures a fair wind all the way. In the other months it is advisable to keep still farther off, say 300 miles, to avoid the calms, and the incessant rains, squalls, and lightnings, which everywhere prevail on the coast at this season.

The following remarks on the passage from South America to Central America, are by Captain De Lapelin, who was sent in the French corvette *La Brillante* to make a reconnaissance of the hydrography of the coast of Central America in 1852.

Whatever may be the point of departure, the first track should take nearly on the meridian of the islands of St. Ambrose and Felix, in order to gain the S.E. trades. After that steer so as to pass some leagues to the West of Point Ajuja, to gain the fine South and S.S.W. breezes which blow throughout the year, and will carry you up with Cape Blanco (Gulf of Guayaquil), which should be made to correct the reckoning. Thence cross the line in

about 83° or 84° W., keeping 50 leagues at least from the Galapagos. From the Equator the destination will regulate the route. If bound to the Gulf of Dulce, or any point East of Point Herradura, in the Gulf of Nicoya, always endeavour to make Point Burrica. If bound for the Gulf of Nicoya make for Cape Blanco, and if for Realejo, make for the Volcano el Viejo, from whence you can easily fetch any point to the West of the Gulf of Papagayos.

But if bound for Acajutla or San José de Guatemala, a direct route from the line passes near to Cocos Island, which being well laid down will make a good point of departure, and then the volcanoes of Central America form excellent landmarks for the ports, as described in the directions. But from May to November, a period when these landmarks are seldom visible, the high lands there being almost always hidden by haze, vessels from the South should make for Cape Blanco, and then follow the coast at a distance of 12 to 15 miles, which can be done without danger. Some think that it is always best for a vessel from the South to make Cape Blanco of Guayaquil, and then Cape Blanco of Nicoya, and then by following the coast that they will find the breezes stronger and the current always favourable.

BETWEEN PANAMA AND AUSTRALIA, ETC.

M. Labrosse states that it will be advisable on starting to make as much southing as possible in order to reach the S.E. trades. Vessels, whose destination is Australia, should therefore at first follow the route to San Francisco or Callao. It will generally be very advantageous to cross the Equator East of the Galapagos, near 83° W., when possible. After the trades are once reached steer for the high lands of Fatu-hiva, Marquesas Islands.

After leaving Fatu-hiva for New Zealand, from December to May, steer so as to pass West of Cook's group, thence South of Nicholson Shoal; cross the tropic near 173° W., and pass westward of the Kermadec Isles. From November to May it is preferable to pass northward and westward of the Tonga Islands, and to intersect the tropic near 180° or 178° E.

Australia to the West Coast of South America.—After a vessel has got to the eastward of New Zealand, she should head, as near as the wind will allow, for her *extreme* parallel, or rather a little to the North of it, 50° S. from October to April, and 52° S. from April to October. Thence make the easting but do not get to the South of these parallels. A vessel bound to Panama can follow a more westerly route than the passage to Callao, and should sight Cape San Francisco.

Panama to China and Japan.—First follow the route from Panama to San Francisco (p. 1247), until the region of steady N.E. trades is attained, and then steer a course to reach the meridian of the Sandwich Islands between 15° and 20° N., and thence follow the route from San Francisco (p. 1244).

North Pacific.

China and Japan to Valparaiso, Callao, and Panama.—In the N.E. monsoon the best and shortest route from Hong Kong is South of Australia, but in the S.W. monsoon, or at all seasons from Shanghai and Yokohama, the northerly route is best. Run down the easting near the parallel of 45° N., where the winds and currents are generally favourable. The N.E. trades should be struck between 148° and 143° W., and the S.E. trades near 5° N. between 118° and 123° W., and from here follow the route from San Francisco (pages 1248, 1253).

Maury advises ships to reach the N.E. trades near 152° E., and to cross the Equator near 172° E., and thence to pass either East or West of New Zealand; but this route appears hardly advisable for sailing vessels as several groups of islands lie in the way.

Panama to the Sandwich Islands.—Reach the S.E. trades as soon as possible, and afterwards cross the Equator near 128° W.; and 10° N. near 138° W. Thence steer with the N.E. trades so as to fetch well to windward of the port of destination. If bound to Honolulu make the island of Maui from the northward.

Sandwich Islands to Panama.—First proceed as for San Francisco (p. 1252), and do not bear South until past 138° W., reaching the N.E. trades near 133° W., and then follow the route from San Francisco.

Panama to the Marquesas Islands and Tahiti.—After leaving Panama make to the southward until the S.E. trades South of the line are reached. Then head for Fatu-hiva, and thence proceed as in the route from San Francisco (p. 1252).

Tahiti to Panama.—First make for the region of West winds, and then run eastward between 35° and 45° S., not passing into the S.E. trades until Cape Blanco bears N. of N.E.

FROM VALPARAISO OR CALLAO TO CHINA, ETC.

This passage may be made by either the N.E. or S.E. trades. The southerly route is to be preferred by vessels leaving from February to July; the northerly route is the better one during the remainder of the year.

Southerly Route.—On leaving vessels should steer N.N.W. or N.W. from Valparaiso, or West from Callao, to strike the S.E. trade region. Then head so as to make Fatu-hiva, Marquesas Islands, and thence steer southward of the Gilbert group and northward of the Pelew Islands. After this, between March and October, in the S.W. monsoon, shape the course toward the Strait of San Bernardino, and enter the China Sea between Luzon and Mindoro. From October to March, in the N.E. monsoon, after leaving the Pelew Islands keep northward of the Philippines, and gain the China Sea by passing through the Bashee group.

There is also another route which has its advantages for ships coming from

the coast of America from February to July. To follow it, after sighting Fatu-hiva, steer so as to cross the Equator near 166° or 168° W.; then steer N.W. and pass North of the Marshall group, or pass between Bonham and Mulgrave Islands, and make to the N.W. between the two chains of islands. After passing northward of the Marshall group the vessel will make rapidly to the westward, keeping southward of Guam, and after this make for San Bernardino Strait.

Northerly Route.—Head with the S.E. trades to cross the Equator near 138° W., and 10° N. near 143° W., the N.E. trades will be found near this parallel. Cross 18° N. in about 160° W., and thence follow the route from San Francisco to China (p. 1245).

China, &c. to Valparaiso and Callao.—See the Route to Panama, p. 1258.

Valparaiso or Callao to the Sandwich Islands.—Make for the S.E. trade region, and then from June to October cross the Equator between 133° and 138° W., and 10° N. at 140° or 141° W., thus avoiding the constant calms which prevail eastward of 133° W. From October to June cross the Equator between 132° and 134° W., and 10° N. at 138° W. Beyond 10° N. follow the route from Panama (p. 1258).

Sandwich Islands to Valparaiso and Callao.—Keep a clean-full on the port tack through the N.E. trades, losing them near 148° W. Then cross the S.E. trades, passing West of the Paumotu, to the region of westerly winds, when the run to the eastward is easily made. Do not stand northward till your port bears to the North of N.E.

Lieut.-Commander James Wood states that, though lying between the parallels of 19° and 23° N. the Sandwich Islands are often visited during the winter months with strong breezes and gales from South and S.W., but for the rest of the year the trade wind blows pretty steadily. In making a passage from thence to the coast of Chile or Peru, the best way is to stand across the trade as near the wind as the topmast studding-sail will stand. This, as the direction of the wind is in general from E.N.E. to East, will enable you to make Tahiti, and pass the Society Islands by one of the clear channels to the westward of them. It is of little use trying to fetch to the eastward of these, as not only do you lose much time by hugging the wind too close, but also the strong current, which sets to the westward from 20 to 40 miles a day, is pretty sure to drift you that much to leeward; and even were this not the case, so difficult, tedious, and dangerous is the navigation amongst the archipelago of low coral islands which lie to the eastward, that, unless you can weather the Marquesas altogether, it is better even to bear up, than to entangle yourself in such a labyrinth. After passing the Society Islands stand on to the southward, till in or about the 30th parallel, when the westerly winds will be found. These will carry you into the coast; care being taken, as on the northern coast, not to bear up when within the influence of the southerly winds, till near enough to the land to ensure keeping them down to your port.

"The steamboat passage will certainly be made from Honolulu to Callao by coming down the trades 'full and bye' direct with the 'doldrums,' then steam to the East, and cut the current (see p. 1202), continue on till near the Galapagos, then cut it again and head straight for port. Care must be taken to keep a reasonable distance from the path of the current, and so keep out of its influence. For the homeward run, watch the thermometer and keep in the current."—*Capt. J. McKirdy, SS. Peruvia.*

BETWEEN CHINA AND JAPAN.

Hong Kong to Yokohama.—*In the N.E. monsoon* work up the coast of China as far as Breaker Point, taking care to be always under the land at nightfall, the wind during the night always hauling to the northward (off the land), when she may make a long tack off, standing in again in the morning when the wind shifts to the north-eastward. From Breaker Point stand across, with the wind free, for the South end of Formosa; a southerly set will be experienced, whilst in the Formosa Channel, but on nearing the island the vessel will lose it, and on passing the South Cape will fall in with the Kuro Siwo setting strong to the N.E.

Vessels following this route (which is usually taken) from March to June inclusive, but more especially in March and April during brisk N.E. winds and a strong westerly current, frequently take a week to reach Breaker Point. Whereas, after clearing Lema Channel, had they stood off on a wind, clean-fall to the S.E., they would soon have got out of the westerly current, and on nearing Luzon would experience the wind more from the eastward, enabling them to tack to the N.N.E. with a strong current in their favour, and thus would probably get to the eastward of Formosa in much less time.

Having passed South Cape, work up the East coast of Formosa, passing westward of the Meiac-sima group and Lu-chu Islands, having the current favourable as far as 26° N., beyond which no current will be experienced until 30° N., where a strong current will be found setting to the eastward, the wind also being more from the North and West. Then pass through any of the channels between the islands lying off the South point of Japan, and then keep at from 50 to 80 miles from the land, in the strength of the Kuro Siwo, making the lights at Oo sima, and then steering to pass just outside Mikomoto or Rock Island, also marked by a lighthouse.

It would not be prudent that any vessel should run the risk of being hampered by the shoals on the northern side of the Meiac-sima group, and therefore they should not go farther eastward than to sight Chung-chi Island. The currents as these islands are approached press more southerly and easterly than those experienced on the coast of Formosa, and stronger breezes prevail as a vessel advances easterly; indeed it blows incessantly at this western group.

A full-powered steam-vessel should keep as close as possible to the China

coast, behind the islands and reefs which line it, as far as Foochow, and then steer for the channel between Tokara and Yoko sima, Linschoten Islands, so as to reach the Kuro Siwo and the N.W. breezes as soon as possible. Then steer to sight Oo sima light, keeping well off shore in the strength of the current. In any case it will be well to sight Omai saki light before making for Rock Island light.

In the S.W. monsoon run up the China coast as far as Tung Ying, then shape a course for Akusi sima, Linschoten group; on passing the meridian of 125° E. the set will be strong to the north-eastward. Pass through any of the channels between the islands South of Japan in preference to Van Diemen Strait, as the dense fogs which hang over the coast at this season render the navigation of this strait difficult, whilst farther seaward, when in the warm stream of the Kuro Siwo, the atmosphere is bright and clear. The route recommended is, after leaving the China coast, to steer so as to pass a few miles clear of the North end of Formosa, and thence for the channel between Tokara sima and Yoko sima. Then steer to make the lights at Oo sima, remembering that the Kuro Siwo runs at from 2 to 4½ knots an hour. After passing Oo sima, steer to make Omai saki, whence proceed on for Mikomoto or Rock Island light.

Yokohama to Hong Kong.—*In the N.E. monsoon* a sailing vessel should stand to the south-westward as far as 28° N. and 135° E., whence a course may be shaped to pass northward of Kakirouma, one of the Lu-chu group, thus avoiding the influence of the Kuro Siwo. After passing Iwo sima a straight course may be steered for Tung Ying, on making which island stand down the China coast for Hong Kong.

A steam-vessel should keep as close to the coast of Japan as is prudent, out of the strength of the current, and pass through Van Diemen Strait, thence steering to pass well northward of the North end of Formosa, to make the China coast, so as to get out of the influence of the Kuro Siwo as soon as possible, and come within the strength of the N.E. monsoon. Thence steer down the coast for Hong Kong.

In the S.W. monsoon, a sailing vessel should steer south-eastward to cross 30° N. in about 145° E., and passing East of St. Margaret Island, cross 140° E. in lat. 21° N.; thence steer (with a favourable current) for the N.E. point of Luzon, on passing which enter the China Sea, when a direct course may be shaped for Hong Kong, taking care to allow for the drift-current setting to the N.E. This route lies directly across the paths of typhoons, which are prevalent in the tropics at this period.

Steam-vessels usually keep well inshore to Oo sima, and then pass through the Inland Sea. Leaving Simonoseki Strait, they keep westward of the Goto Islands, and making the Saddle Islands off the Yang-tse keep close to the shore, and from thence pursue the same course to the southward as vessels bound from Shanghai to Hong Kong. Some steam-vessels, however, adopt

the same route as in winter as far as the entrance to Formosa Channel, whence a straight course is shaped for Hong Kong.

Between Hong Kong and Nagasaki.—*In the N.E. monsoon*, a sailing vessel or auxiliary steamer proceeding from Nagasaki to Hong Kong should steer to make the China coast a little below Chusan, so as to fall in with the strength of the monsoon as soon as possible. From Hong Kong to Nagasaki the China coast should be kept (within the islands) until North of Foochow, whence a direct course may be shaped.

In the S.W. monsoon.—After leaving Tung Ying steer for the Mé sima group, and passing between it and Pallas Rocks, a course E.N.E., 80 miles, will place the ship off the lighthouse on the North point of Iwo sima, at the entrance to Nagasaki Harbour, on nearing which it should not be brought to bear northward of N.N.E.

Hong Kong to Lu-chu.—Lieut. H. K. Stevens, of the U. S. Expedition, 1857, gives the following directions:—*During the S.W. monsoon*, vessels should pass through Formosa Channel, giving the islands off the North end of Formosa a safe berth. From thence steer to pass northward of Hoa-pin-su, Ti-a-usu, and Raleigh Rock, after which haul to the eastward to sight Komisang, and pass either northward or southward of it, and of Tunashee, but not between them; then pass southward of Agunyah, and in a short time the Reef Islets off Napha-kiang will come in sight.

During the N.E. monsoon, round the South end of Formosa, and work to the northward and eastward along its eastern shore. Pass between Hoa-pin-su and the Meiaco-sima group, and either northward or southward of Komisang. During the typhoon season, however, it is advisable to pass southward of the Meiaco-sima group, in order to have plenty of sea room.

Vessels bound into the road from the southward may pass close round Cape Yakimu, and keep 3 or 3½ miles off the western coast, leaving Heber and Halls Reefs to the westward.

Sailing from Napha during the N.E. monsoon, it will be better to pass round the South end of Great Lu-chu, in order to avoid beating through the Montgomery group. But with a southerly wind and fine weather it will be to the advantage of a vessel bound to the Bonin Islands to pass round the North end of Great Lu-chu, where she will feel the influence of the current, which will assist her to the eastward.

From Shanghai to Nagasaki.—*During the N.E. monsoon*, if the wind is to eastward of North, it would be well on leaving the Yang-tse to stand to the north-westward on the starboard tack, and when the wind hauls round to the north-westward, tack, and steer a straight course for Nagasaki, making allowance for the south-easterly and easterly set from the Yellow Sea and Korea Strait, otherwise the ship may be swept to the eastward through Van Diemen Strait. During the periodic easterly winds (variable between E.N.E. and S.E.) which prevail on the China coast in the vicinity of the Yang-tse, from

March to June inclusive, a sailing vessel must take every opportunity to make easting, even with a fair wind, which it may be almost surely inferred will be but of short duration. In May and June, however, the set of the current will be changed, and will be found setting to the north-eastward; under these circumstances there is a probability that a vessel kept on the starboard tack would be set over to the Korean Archipelago. With these considerations the navigator must act on his own judgment, there being only difficulty in making the passage, when baffling winds, and thick, rainy, and squally weather are met with in the vicinity of the *Mô sima*, *Pallas Rocks*, or *Goto Islands*, or they are passed on dark nights. If not, therefore, sure of the vessel's position, it would be well to make them in the daytime, unless the nights are moderately fine. The light on the southern point of the *Goto Islands* is of great assistance in making this passage.

Shanghai to Nagasaki.—On leaving the *Yang-tse* during the S.W. monsoon, steer to pass between *Pallas Rocks* and *Mô sima* group (*Asses Ears*), which last is visible in clear weather at a distance of 30 miles. The current will be found setting to the north-eastward through *Korea Strait*; care must be taken, therefore, to avoid being set to the northward of the South point of the *Goto Islands*. Passing *Amherst Rocks* a course E. $\frac{1}{2}$ N., 390 miles, will lead midway between *Pallas Rocks* and *Ose saki* or *Cape Goto*.

Shanghai to Yokohama.—On leaving the *Yang-tse* the wind will be rarely found as far to the eastward as N.E.; it is best, therefore, to keep the ship on the starboard tack, remembering that she will be set to the eastward toward *Van Diemen Strait*; after passing which pursue the same route as directed in the passage from *Hong Kong* (p. 1261).

To Hakodate through Korea Strait.—If bound on to *Hakodate* in the N.E. monsoon, or even as late as the end of June, it will be found difficult with a sailing vessel to make easting at all, along the West coast of *Nipon*. It will be advantageous in April, May, and June, to pass well East of *Tsu sima* in the strength of that branch of the *Japan Stream* which sets N.E. by N. through *Korea Strait*, attaining at times, although not constant, a velocity of 2 knots an hour. Should a S.W. wind occur at this season, it may be expected to last only 24 hours, unless it follow an easterly gale with depressed barometer. During the winter, gales from North and N.W. are very frequent in *Korea Strait*, lasting three or four days, and are sometimes violent. A rapidly falling barometer indicates their approach. In such weather, if making for *Nagasaki* on the port tack, beware of being blown to leeward into *Van Diemen Strait*, for if set through by the *Japan Stream*, it will take a long time to regain the lost ground against the current; and if on the starboard tack, there is probability of being set up the *Korea Strait* to the northward of *Ose saki*. It is recommended that they should then endeavour to make the land in daylight, and find anchorage, or secure a knowledge of their position.

In winter, when N.W. and West winds prevail, a direct course should be

steered from Korea Strait to Hakodate; but if bound from *Hakodate southward*, it is necessary to endeavour to make westing when possible, and keep a long offing, for the coast of Nipon is a lee shore. After passing Korea Strait as well to windward as possible, the winds will be found more liable to change when arrived at lat. 32° N., long. 125° E., but sometimes they continue so steadily between N.W. and W.S.W., as to set a vessel to leeward of the Yang-tse.

Yokohama to Hakodate.—With the exception of the severe cold, the winter is the most favourable season for making this voyage, as the wind is then nearly always off the land, and consequently smooth water is experienced close along the coast. At this season, however, strong N.E. gales are occasionally met with. Steer to pass from 4 to 6 miles off the prominent points. Northward of Kingkasan the Oya Siwo will be felt, and thick weather, with heavy snow-storms, are frequent, rendering it necessary to use every precaution.

In summer, as in winter, keep near the land. Off Kingkasan, where the vessel will pass into the Oya Siwo, a dense bank of fog is met with, and from hence northward its density and permanency form a serious impediment to navigation, rendering the very greatest caution, and frequent attention to the soundings, absolutely indispensable.

Should thick weather prevent Siriya saki light being seen, the temperature of the sea water will, if carefully watched, be a guide as to whether the vessel has passed the cape, as the temperature of the sea in Tsugar Strait is invariably higher than that of the sea to the southward. Heavy tide-rips too are invariably met with in the centre of the eastern entrance to the strait, about 10 miles North of Siriya saki; and when the vessel comes within the influence of the easterly current setting through the strait, much floating débris is met with.

BETWEEN THE ISLANDS, ETC.

Sandwich Islands to Tahiti.—There is great difficulty in making this passage across the trades. The whalers and all others speak with great doubt of fetching Tahiti from the Sandwich Islands. Captain Bruce says that a vessel should keep to the northward until she gets a start of wind before bearing for her destination. In his passage between them in November, 1837, he had no variables near the line in coming South, and never could make casting on either tack, though he endeavoured by every means in his power to do so.

The most favourable time to make this passage is from the end of March to the middle of June, but even then it will be difficult to fetch Tahiti without going about.

The *Imogene* left Karakakooa Bay, October 17, 1837, and, reaching the South point of the island after twenty-five hours' sail, bore away on a S.S.E. course with a fiery trade at E.N.E.; this failed on the 22nd; the ship was tacked to a southerly breeze, which lasted till the 26th, when a fresh S. by E.

trade sprang up. Between the 21st and 25th an easterly current set for 30 to 35 miles a day; after that a westerly current of 16 to 40 miles per day was found. Every opportunity was seized to gain easting, and to get to windward of the meridian of Tahiti, but without success. The Equator was crossed on October 28th, in long. $154^{\circ} 40'$, wind E. by S., having been on a bow-line ever since leaving Hawaii. Passed Bellingshausen Island on November 5th; and, as the ship drew to the southward, the wind gradually drew to East, E.N.E., and N.E., always bringing the port directly in the wind's eye. November 8th, passed Rimitara; on the 9th, squalls, with most terrific rain; on the 10th, the wind veered to N.W., and finally S.S.W.; on the 11th, saw Rurutu. The wind now favoured the ship, and for the first time since leaving Hawaii she laid her course, and continued to do so. Bearing W.N.W., 7 or 8 leagues, made Tahiti on the 13th, and anchored the same day at Papiete. Thus, had not a favourable change in the wind occurred in the latter portion of the passage, she would have been to leeward.

Tahiti to the Sandwich Islands.—From June to November a vessel could easily fetch to windward of the Sandwich Islands if she crossed 10° N. near 148° W. During the rest of the year it will be difficult to cross 10° N. so far to the East, and almost impossible to make Hawaii.

In the passage from Tahiti to Hawaii, Capt. Beechey says:—From the time we passed Maitea we endeavoured to get to the eastward, and to cross the Equator in about 150° West longitude, so that, when we met the N.E. trade wind, we might be well to windward. There is, otherwise, some difficulty in rounding Owhyhee, which should be done about 40 miles to the eastward to ensure the breeze. The passage between the Society and Sandwich Islands differs from a navigation between the same parallels in the Atlantic, in the former being exempt from the long calms which sometimes prevail about the Equator, and in the S.E. trade being more easterly. The westerly current is much the same in both; and if not attended to in the Pacific, will carry a ship so far to leeward, that, by the time she reaches the parallel of the Sandwich Islands, she will be a long way to westward, and have much difficulty in beating up to them.—*Beechey's Voyage*, vol. i., page 230.

Sandwich Islands to China.—Make your westing between 20° and 15° N., and in the latter part of the voyage follow the route from San Francisco.

Across the Equator.—In a review of the routes of the U.S. Exploring Squadron from the Fiji Islands to the northern hemisphere, Captain Wilkes says:—It will be apparent that there is no necessity for vessels bound to the northward and eastward across the Pacific Ocean to make for the northern variables, as has heretofore been the practice, thus making a very circuitous course, and occupying a much greater portion of time, besides subjecting themselves to encounter much bad weather. This, however, is not to be understood as applying to vessels to the westward of long. 180° : they ought to make the

North Pacific.

7 Y

shortest possible stay within the Trades; and, if this is determined upon, they should steer due North, without regard to making easting, until they have fully entered the variables. It is, however, at times, very doubtful where they will encounter them; and as far as our experience goes, and that of other navigators whom I have consulted, they ought not to be expected short of lat. 27° to 20° N., to which parallel the Trades often reach. The great difficulty seems to be, with many, that on the first wind from the West being encountered, they are induced to believe that it will prove constant, when nine times out of ten they will be deceived.

Sandwich Islands to Australia.—Shape a course to lose the N.E. trade near 168° W., and cross the Equator between 168° and 173° W., the track lying to leeward of several low coral islands. Pass West of Mathew Island, thence steer about W.S.W., and clear the reefs of New Caledonia well to the southward.

Australia to Tahiti and the Sandwich Islands.—A ship leaving Sydney, from May to August, can pass North of New Zealand, thence South of the Kermadec Islands, and then make her easting South of 30° S., crossing that parallel between 158° and 153° W. From September to April Cook Strait is to be preferred; then run down the easting, doubling Chatham Islands to the northward, and crossing 30° S. near the meridian of Rapa Island, and make Tahiti from the eastward, and pass between Anaa and Maitea. From May to August a ship can generally pass westward of Moorea, and then go about for Papiete.

If bound to the Sandwich Islands, always cross 40° S. near 143° W., thence pass near and a little westward of Pitcairn and Oeno Islands; cross the Equator near 133° W., and thence follow the route from Valparaiso (p. 1259).

Fiji Islands to the Sandwich Islands.—Run through the S.E. trades on the port tack, and the westerly winds will generally be found near 30° S. Strike the S.E. trades again eastward of the Paumotu. Vessels can also run through the S.E. and N.E. trades on the starboard tack, and make their easting near 30° N. Vessels bound from the Sandwich Islands to the Fiji Islands should follow the route to Australia.

Marquesas Islands to the Sandwich Islands.—This passage is not difficult. Cross the Equator as far East of 143° W. as possible, with a clean-full on the starboard tack, and then follow the route from Valparaiso (p. 1259).

JAPAN TO AUSTRALIA.

In the N.E. monsoon, commence the voyage as if bound to California, and make the easting North of the 30th parallel, not bearing South till 165° or even 172° E. is reached. Thence the voyage is easily accomplished. The Equator should generally be crossed between 162° and 167° E. In the S.W. monsoon commence the voyage as before, but the West winds will not usually be found below 35° N. It is not advisable to bear South until beyond 167° E.,

nor is it well to enter the trades westward of 172° E. Thence proceed as before (p. 1266).

Some additional remarks as to the routes between China and Japan, and from these countries to and from Australia, &c., will be found in the Directories for the Indian Archipelago and the South Pacific Ocean.

The foregoing will be all that is necessary to elucidate the navigation of the North Pacific Ocean, which is very simple when away from the land influences which cause the embarrassing winds, calms, and currents, which have been alluded to. The illustrative charts of the Winds, Currents, and Passages will enable the navigator to choose the best route and readiest means of shortening a passage not specifically described.

In closing this book, which may be taken as the concluding volume of the series of six which describe the great oceans of the world, the author has much gratification in mentally reviewing his past labours, and the pleasure it has given him to collect the funds of varied information they contain. The coasts of the whole world have been described in them. The ports open to its commerce, the dangers which are to be avoided by its mariners, the innumerable features of interest and wonder which distinguish its shores, are more or less minutely described or alluded to. The marvels of the oceans themselves, their depth, and the mighty circulatory systems which give but one uniform characteristic to the world of waters, the effects of the winds which blow over them, the meteorological influences which affect the sailor's avocation in every quarter of the globe, are all, it is trusted, faithfully represented in them.

In full confidence of their utility as thus collected, the especial thanks of the author are now accorded to all who have added to that rich mine of hydrographical literature, from which he has been able to draw the materials for these books.

In the preface to this, as in those to his other works, these obligations are more especially particularised, and it is earnestly hoped that no source of information has been overlooked, or that there is any omission of acknowledgment to those who have furnished the materials for them.

INDEX.

- Aaltanhash Inlet, 533
 Aamak Island, 685
 Ala Bay, 906-7
 Abashira, 868
 Abatanok Island, 671
 Abbey Hill, 256
 — Point and Reef,
 1150, 1152
 Aboriseen, 539
 Abolcheff Bay, 712
 Abrek Bay, 772
 Abre-ojo Reef, 1142
 Abreojos Point, 187, 188-9
 Aburatan Harbour, 880
 Aburatau Harbour, 786
 Acahi-Fanahi Point, 1045
 Acajutla, Port, and Light
 3, 64, 70-4, 1257
 Acapulco, 97-102, 1174,
 1240, 1250, 1255
 Ackashar, 1013
 Acland Islands, 380
 Acoucheki Island, 1146
 Acteon Sound, 503
 Active Cove, 367
 — Pass, 364, 381-3,
 458
 — Point, 378
 Ada Rock, 517
 Adair Bay, 144, 146
 Adakh Island, 690
 Adam Peak, 1161
 Adams Point and Light-
 house, 300-301, 1158
 Addenbrooke Island, 620
 — Point, 518
 Addington, Cape, 605
 Adeloup, Point, 1045
 Admiral Bank, 799
 — Island, 374, 376,
 079
 Admiralty Bay, 636
 — Head and Light-
 house, 332-3
 — Inlet, 331-8
 — Island, 607, 610,
 614
 Adolphus, Point, 622
 Auktok Island, 671
 Ai-sho-sho-ran Lagoon,
 272
 Affleck Canal, 604
 Afogak Island, 655, 660
 Afuera Island, 20
 — Point, 199
 Afuerita Islet, 21
 Afuiva, Morro, 138
 Agamemnon Channel, 486
 Agana, 1080, 1046
 Agat, 1044
 Agatton Island, 669, 663
 Agonch Island, 665
 Agfayan Bay, 1047
 Aghsinak Island, 1156
 Agiabampo Estero, 135
 Agi kawa, 805, 807
 Agoukak River, 687
 Agrigan Island, 1049, 1035,
 1056, 1058
 Agua Verde Bay, 163
 Agua, Volcan de, 3, 75, 77
 Aguatulo, 94
 Agujan Island, 1037, 1049
 Aguja Peak, 179
 — Point, 157
 Agunyah Island, 1152, 1156
 Ahayan, Point, & Bay, 1042
 Ahmon Creek, 273
 Ahome, 135
 Aian, Port, 746-7, 1183
 Aiberan River, 1022
 Aikawa, 873
 — Bay, 851
 Ailinginae Islands, 962-3
 Ailing-Jappel Islands, 964
 Ailinglabelab Islands, 965
 Ailiuk Islands, 952, 960
 Ain River, 583
 Aino Island, 862
 Ai-no-se, 891
 Ai-no-sima, 790, 794, 901
 Ai-no-ura, 893
 Airek Islet, 958, 966
 Ai-sima, 880, 882
 Ajax Bay, 770
 Ajayan, Point, and Bay,
 1042, 1045
 Aji, River, 806
 Ajima Island, 877
 Ajuro Bay, 829, 916
 Ajuja, Rio, 35
 Akademie Gulf, 748
 Akashe-hana, 910
 Akagawa mura, 855
 Akamokum Island, 1014
 Akashi Strait, 804-5
 Aka-sima, 895, 1155
 Akono misaki, 800
 Akenose misaki, 800
 Akhonten Bay, 735
 Akin Reef, 1142
 Akishi Bay and Harbour,
 863, 865
 Akona, 1080
 Ako saki, 836
 Akoun Island, 671
 Akounkei Strait, 671-2
 Akoutan Island, 672
 — Strait, 671, 674,
 677
 Akuisi sima, 1146
 Akunora, 904
 Alacritty Anchorage, 1017
 Alaid Island, 737
 Alajuela, 38
 Alalekeiki Channel, 1090
 Alamagan Island, 1055,
 1066, 1067
 Alamiut River, 305
 Alamos River and Mount,
 135, 136
 Alan Island, 345
 — Point, 423
 Alarm Rock, 377-8, 547
 Alaska, Coast of, 690-707,
 1169, 1178
 Alau Islet, 1086
 Alava, Point, 595
 Aliberni Inlet, 406, 409-411
 Albert Head, 396
 — Peninsula, 770
 Albina, 309
 Albion River, 264
 Aloas Rock, 722
 Alcatraz Rocks, 96
 Alcatraz Island and Light,
 245
 Alceme Island, 1145
 Alden Bank, 354-5, 366
 Alder Island, 575
 Aldema Bay, 746
 Aldrich Point, 527
 Alenuihaha Channel, 1083
 Alort Bay, 504-6
 — Point, 929
 Alot Island, 908
 Aleutian Islands, 590, 591,
 661, 669-684, 1169, 1213
 — Sea, 661
 Alexander Archipelago,
 634-634
 — Point, 486-7,
 602
 — Port, 507, 508,
 620

INDEX.

1269

- Alexandra, Fort, 688
 - Passage, 516, 530
 - Patch, 550
- Alexandria, Fort, 521
- Alexandroffsk, Fort, 650, 688
- Alexandrovsk, 773
- Alexandrovsk, 763
- Alexinoy Island, 665
- Alford Reefs, 551
- Algodones Islands, 141
- Ali sima, 813
- Alaska Peninsula, 665-8, 685-7
 - Sea of, 661
- Alice Arm, 565
 - Thorndike Reef, 932
- Alijos Rocks, 185, 1107
- Aliuk Bay, 659
- All Alone Stone, 575
- Allen Bank, 334, 337
 - Island, 948
 - Islands, 151
- Alliford Bay, 579, 580
- Alligator Hill, 135
 - Shoal, 1036
- Almagre Islands, 137, 140
- Almagrito Island, 137
- Almejas Bay, 180, 181
- Almirante Fuentes, Estrecho del, 598
- Aloupan Island, 1044, 1046
- Alpha Bay, 549
 - Islet, 403
- Alsek, River, 636
- Alseya, River, 290
- Altamuna Point, 134
- Altar, 143
- Altas, Sierras, 230
- Altata, 133-4
- Althorp, Port, 623-4
- Altona Gulf, 625
- Altung Island, 1044, 1046
- Amagi yama, 829
- Amak Island, 685
- Amaki Bay, 804
- Amakirima Islands, 1155
- Amakusa Island, 907-8
- Amami Oe sima, 1146, 1147-1148
- Anantes, Point de los, 1046
- Anapala, Gulf of, 57
 - Island, 58, 69, 62
 - Point, 65
- Amatapa, Gulf of, 57
- Amatignak Island, 631
- Amatitlan Lake, 75
- Amaze Rock, 798
- Amburnoh, River, 1022
- Amchitka Island, 669
- Ameca, Rio, 111
- Amelia Island, 1138
- Amelina, Point, 604
- America Bay, 773
- American Bay, 606
 - Isles, 928
 - River, 249
- Americano, Estero, 261
- Amesport Landing, 237
- Amessee Island, 993
- Amicitia Island, 989
- Amitsu-hama Island, 850-851
- Amia Island, 678
- Amognak Island, 672-3
- Amortajada Bay, 165
- Amoughta Island, 676
 - Channel, 677
- Amoukhtou Island, 676
- Amphitrite Point, 418
 - Strait, 728
- Amsterdam Island, 1142
- Amchitka Island, 682
- Amchitka, Cape, 674
- Amur Bay, 769-770
 - Gulf of, 767, 761, 764-767
 - River, 742, 748, 764-767, 1183-4, 1214
- Amytideo Island, 997
- Anacapa Bay, 224
 - Island, 223-4
- Anachoretas Island, 1015
- Anadyr, Gulf of, 715-720
 - River, 715, 719, 1181
- Anadyrsk, 719
- Anaheim, 212
- Anama Point, Spit, and Lightvessel, 858, 859, 860
- Anatajan or Anataxan Island, 1055
- Anchor Bay, 628
 - Bight, 517
 - Cone, 536
 - Cove, 580
 - Mountain, 549
 - Point, 651
- Anchorage Island, 445, 814
- Anchorite Isles, 1015-16
- Ancon, Cerro, 12
- Andema Islands, 986
- Anderson Island, 339, 702
- Ando Bay and Port, 857
- Andréanoff Islands, 669, 677-681
- Andrews Island, 1108
 - Port, 549
- Ane-oo-roon, 1081
- Angaligarail Island, 1002
- Angaur Island, 1011, 1014-1015
- Angel Island, 247
 - de la Guardia Island, 148-9
- Angel, Puerto, 95-6
- Angeles Bay, 149-150
 - Island, 148
 - Port, 95-6
 - Pueblo de los, 213
- Angelos Point, 328
 - Port, and Light, 328-9
- Anger Island, 546
- Anian, Strait of, 204, 321, 682
- Anil Island, 954
- Animak Island, 667
- Animas Bay and Point, 150
- Animas, Boca de las, 186
 - Islands, 161
 - Isleta, 166
 - Morro de las, 102
- Anita Rock and Beacon, 246
- Aniwa Bay and Cape, 749, 753-5
- Anmer Point, 610
- Ann Island, 618
- Anna Island, 1026-7
- Annas Bay, 342
- Annette Creek, 381
- Ano Nuevo, Point, and Island, 235
- Anonima Island, 996, 997
- Anoriaki and Lighthouse, 820
- Ansley Island, 621
- Anson Islands and Shoal, 1061
 - Road, 1049, 1051
- Ansus Harbour, 1023
- Ant Islands, 986
- Anthony Island, 672-3
- Antipanko Island, 769
- Anvil Island, 432
- Ao sima, 879
- Aoga Island, 845, 847
- Aoga ura, 1156
- Aogi ato, 797, 798
- Aosima yama, 874, 875
- Aoumi sima, 880
- Aoura Island, 978
- Apaiang Island, 937, 948
- Apamama Island, 939, 945-4
- Apama Island, 1044
- Aphoon River, 691-2
- Apia Island, 948
- Apollos Island, 1143
- Apple-tree Cove, 334
- Apra, 1044, 1045
- Apuequan, Point, 1046
- Apurquan, Point, 1046
- Aqua Papa Mountain, 133
- Arabia Shoal, 1108
- Arachne Reef, 374
- Arafuku Island, 893
- Arago, Cape, 285-6
- Arakametchetchon Island, 711, 712
- Araktcheef Islands, 957
- Aranuka Island, 937, 944-5
- Arari Bay, 823, 825
 - Point, 813
- Ara sima, 824
- Arauca Barba, Point, 44
- Arayonzet Island, 1011
- Arboleda Point, 136
- Arboleta, 135
- Arbutus Islet, 374
- Arcata, 270
- Arch Rock, 246, 294, 296, 892
- Archangel Gabriel Bay, 720
- Archimede Island, 1145
- Arco, Cape, 140
- Arcoos Rocks, 111
- Arden, Point, 610
- Ardilla Islo, 140

- Aremolungui, Mount, and Passage, 1011, 1014
 Arena Island, 66
 —, Point, 174, 173
 —, Point, and Light-house, 264
 —, Punta, 161
 Arenas, Punta, 32, 37, 38-40
 Arenitas, Punta, 32
 Arguillo, Point, 227
 Arguilla, Point, 227
 Argon, River, 765
 Arhno Islands, 962, 965-7
 Ariaki no ura, 786
 Arii Rock, 722
 Arimoa Islands, 1022
 Aris Island, 1020
 Ariapo, 130
 Aristazable Island, 540, 542
 Arta, 866
 —, River, 812
 Arizona and City, 129, 146
 Arkold Rock, 850
 Armijitoaki Passage, 1012
 Armstrong, Port, 620
 Arnold Point, 146
 —, Rock, 435
 Arnoura River, 715
 Arrostock Reef, 877
 Arore Island, 939
 Arran Rapids, 493
 Arranco Caballo Point, 170
 Arrocifos Islands, 969, 1008
 Arrinas Islands, 161
 Arrowsmith Islands, 955
 —, Mount, 475
 Arsenal, Estero del, 116, 117
 Artek Island, 1012
 Arthur Island, 587, 969
 —, Passage, 538
 Artinagal, Cape, 1011, 1012
 Aru Point, 981
 Arandell Point, 816, 817
 Arumi Island, 939-940
 Arzobispo Island, 1136
 —, Islands, 1128-1136
 Asadero, Estero, 120
 Asama Bank, 888
 Asan, 1039
 Asashe Reef, 1151
 Asatcha Bay, 736
 Ascension, Ensenada de, 278
 Ascension Islands, 979
 Asceradores Island, 61, 62, 63, 67
 Ashika sima, 833, 840
 Ashumah Island, 1161
 Asi sima, 851
 Asia, Coast of, 707
 Auna Bay, 830
 Askold Island and Light-house, 769, 772
 Aspinwall, 131
 Asushi Rock, 1143
 Asutichinskoi Volcano, 725
 Asos' Eate Island, 898
 —, Peak, 11
 Asutina Island, 877
 Assumption Island, 1059
 Astley, Point, 610
 Aston Rocks, 879
 Astor Point, 306
 Astoria, 300, 306, 1176, 1177
 Astrolabe Bank, 1018-19
 —, Rock, 877
 Asuncion Island, 189-90, 1055, 1059
 —, Point and Bay, 69
 Atami Bay, 829
 Atashika ura, 818
 Atatau, 822
 Atcha Island, 678
 Athos, Mount, 713
 Atitlan Volcano, 3, 75
 Atkha Island, 678-680
 Atkinson Point and Light-house, 464, 465, 481
 Atlantic Island, 978
 A-tli Inlet, 576
 Atna River, 642
 Atunah Cavern, 667
 Atoci Island, 1099
 Atos Creek, 233
 Atowai Island, 1099
 Atsuda Bay, 822
 Atsusi no O sima, 886
 Attcheun, Cape, 717
 Attou Island, 669, 683-4
 Auau Channel, 1090
 Audiencia, Punta de la, 106
 Augusta, Point, 620
 —, Port, 476, 478
 Augustin, Mount, 652
 Auke Harbour, 611
 Au'ong Island, 1014
 Auri Islands, 951, 952, 957
 Australia, 1242, 1257, 1266
 Austro, Cape, 63
 Avakum River, 775
 Avatanak Island, 871
 Avatcha Bay, 729-735, 1208
 —, Estero, 261
 —, Volcano, 725, 731
 Aves Islet, 39
 Avila, 228
 Avinoff, Cape, and Bay, 689, 690
 Aves Rock, 738
 Awa Peninsula, 825, 831-2
 —, sima, 789, 801, 871, 872
 Awadji Island and Light-house, 801, 809-811
 Awanai no saki, 869
 Awas sima, 885
 Awatska Bay, 729, 1208
 Awomori, Bay, and Light-house, 856-7
 Axusco Volcano, 51
 Ayak Island, 695
 Ayan, Port, 746-7
 Ayougadagh Island, 682
 Ayuca, Morro, 89
 Ayuta, Morro, and River, 89, 90
 Azada Island, 121, 126
 Aziak Island, 695
 Azika sima, 887
 Azuma, 835
 Ba-ad-dah Point, 327
 Babbington Harbour, 762
 Babelthnap Island, 1011-12
 Babine, Lake, 639
 —, River, 456
 Baboushka Rock, 731, 732
 Bacatele, Mount, 137
 Bache, Mount, 235
 Baccoc bampo, 140
 Bag Harbour, 574
 Bahia Honda, 21-2
 Bailey Islands, 1128, 1134-1136
 Bainbridge Island, 335
 —, Port, 646
 Baja, Punta, 137, 153, 161, 198
 Baje Point and Reef, 432
 —, Reef, 428, 429
 —, Rajado Island, 27
 Bakai, 571
 Baker Bay, 298, 304
 —, Island, 932-4
 —, Mount, 344
 —, Passage, 489
 —, Point, 603, 604
 Bakmanova, 765
 Balaklava Island, 501, 508
 Balandra, Puerto, 170
 Balbi Point, 768
 Balch Passage, 339
 Bald Head, 694
 —, Peak, 316
 —, Pate Mountain, 237
 Balder, Brazo de, 502
 Baldwin, Brazo de, 502
 Bali Island, 1042
 Bali, Cape, 581
 Ballandra, Puerto, 161
 Ballast Point, 208, 209
 Ballena, Cabeza, 177
 —, Rock, 36
 Ballenas Bay, 187
 —, Channel, 148
 —, Island, 167
 —, Lagoon, 188
 —, Point and Bay, 254
 Ballenita Rocks, 35
 Ballinas Islands and Channel, 473, 474-5
 Ballousek, Cape, 776
 Baltasar Head, 19
 Bamba, Bay of, 89
 Bamfield Creek, 407
 Bamfield Islets, 538
 Banaba Island, 949
 Banco, Punta del, 32, 34
 Banda Point, 201
 Banderas Bay, 111
 Bandzu hana, 839
 Banks Island, 545, 547
 —, Port, 634
 Babeltaob Island, 1011
 Baptist Bay, 627
 Bar Rocks, 579, 580
 Baraco Island, 29

Baranca, Rio, 40
 Baranoff Island, 619, 627,
 633
 Baranov, Cape, 759
 Baranovitch, 600
 Barbacoas, 13
 Barbadoes Islands, 958
 Barbary Island, 932
 Barber Island, 931, 932
 — Point, 1094
 Barclay Sound and Chanls.,
 389, 404, 406-419
 — Valley, 526
 Bardwell Islands, 526
 Bare Island, 372, 657
 — Islands, 480
 — Islet, 369, 420, 425,
 448, 579
 — Point, 377
 Barfleur Passage, 482
 Baring Islands, 968
 Barking Sands, 1102
 Barlow Cove, 612
 Barn Head Reef, 1151
 Barnabas, Cape, 659
 Barnabé Rocks, 150
 Barnard Cove, 544
 Barnes Island, 354
 Barnett, Cape, 606
 Barneveld Island, 442
 Barneya Rock, 1108
 Barnpool, 1151
 Baross, Mount, 761
 Baroyca Mountains, 137
 Barr Island, 953
 Barra Falls, 53, 54
 Barracas, Cape, 154
 — Table Hill, 155
 Barracouta Bay, 757, 761-
 762
 — Rock, 901, 905
 Barron Bluff, 762
 — Island, 656, 658
 — Islands, 650
 — Rock, 503
 Barriack Rock, 755
 Barrie, Point, 693, 604
 Barrier Island, 747
 — Islands, 437, 441, 517
 Barron, Rio, 120
 Barroca Passage, 967
 Barrow Bay, 1150, 1154-5
 — Point, 700
 Barter Cove, 441
 Bartholomew Island, 8
 Bartlett Island, 420
 Bartolomé River, 29
 Basalt Point, 340
 Base Flat, 477
 — Point, 425
 Basil, Port, 647
 Basiliak Gorge, 1018
 Bass Reef-tied Islands, 957
 Bassoon Island, 1115
 Bat Islands, 43
 Bate Passage, 509
 Battery Point, 335
 — Point and Light-
 house, 274

Battle Bay, 441, 442
 — Rock, 282
 Baubelhouap Island, 1011
 Baugh Island, 1158
 Baugne, Point, 1014
 Bawden Bay, 425
 Bay Islet, 567
 — Rock, 906
 Baynes Channel, 403
 — Mount, 379
 — Sound, 473, 474,
 476-9
 Bayona, Rio, 120
 Bayoneta Island, 8
 Bayonnaise Rocks, 845
 Bazan, Port, 606
 Beachy Head, 761
 Beacon Hill, 401
 — Rock, 471
 Beak Point, 477
 — Cape, and Light-
 house, 407, 411
 Bear Creek, 268
 — River, 567
 Beardslee Islands, 622
 Bearskin Bay, 579
 Beaton Island, 598
 Beauchere, Port, 604
 Beaufort, Cape, 700
 — Mountains, 478
 Beaver Bark, 530
 — Cove, 504
 — Creek, 290
 — Harbour, 506-7
 — Ledge, 541
 — Passage, 516, 549
 — Rock, 497, 555
 Becher Bay, 225, 294-5
 — Mount, 478
 Bede, Point, 650
 Bedford Island, 537
 — Islands, 294
 Bedwell Harbour, 368
 — Islets, 449
 — Sound, 422
 Bee Islets, 491
 Beechey Head, 394
 — Islands, 1128,
 1130-4
 Beehive Hill, 96
 Begg Rock, 223
 Behm Canal, 595-7
 Behring Bay, 636-8
 — Cape, 717
 — Island, 688, 721-2
 — Sea, 661, 684-723,
 1181, 1214, 1229
 — Strait, 662, 698-700,
 707-8, 1194, 1216, 1230
 Bekho misaki, 869
 Belakula, 521-2
 Belcher, Cape, 700
 Belhous and River, 521
 Belitro Point, 24
 Belize Inlet, 512
 Belkoffski, 667
 Bell Island, 597
 Bella Bella Islands, 523
 Belle Rock, 352, 353

Belleisle Sound, 502
 Bellingham Channel and
 Bay, 343, 346-7
 Bellingshausen, Cape, 751
 Belmont Point, 433
 Ben Rock, 200
 Benado Island, 18
 — Isles, 29
 Benicia, 249
 Benoist, Mount, 1021
 Ben-ten sima, 510, 857
 Benten sima and Light, 867
 Bentineck Arms, 621
 — Island, 395, 396
 — Point, 643
 Berens Island and Light,
 399
 Berkeley Sound, 406
 Bernardo, Rio, 227
 Berners Bay, 615
 Bernist Peak, 740, 752,
 758
 Beroo jima, 909
 Berry Peak, 701
 — Point, 469, 517
 Bertha Glacier, 616
 Bertrand Island, 1020
 Besborough Island, 694
 Best Island, 1032, 1033
 Betchevinskai Bay, 728
 Betchevinskoi, Cape, 679
 Biak Island, 1024
 Bickyna, Cape, 761
 Big Bay, 553
 — River, 265
 Bigali Islet, 599
 Bigar Island, 961
 Bigelj Island, 965
 Bright Cone, 432
 Bugini Islands, 962
 Bigsby Inlet, 576
 Bikar Island, 952, 961
 Bikini Islands, 962, 933
 Bill of Orcas, 362
 Bingham Passage, 948
 — Point, 624
 Bingo nada, 785, 797-801
 Binah Reef, 814
 Biorka Island, 630, 631, 634
 Birch Bay, 347
 Bird Cape, 682
 — Cove, 492
 — Island, 519, 931, 950,
 1054, 1105-6
 — Islands, 737
 — Islet, 108, 373
 — Islets, 415
 — Reef, 377
 — Rock, 246, 352, 353,
 530
 Bird's-eye Cove, 376
 Biriyo sima, 892
 Birnie Island, 555
 Biro sima, 896
 Birthday Channel, 435
 Bischoff Islands, 575
 Bishop Island, 936, 941, 944
 — Rock, 219, 1138,
 1140

Bishop Junction Islands, 958
 Bishops Cove, 533
 Bitters Rock, 755
 — Rocks, 855, 872
 Biwa, Lake, 805, 807, 837, 877
 Black Cape, 675
 — Head, 104
 — Islets, 361
 — Mountain, 235
 — Point, 196, 244, 1149
 — Rock, 122, 164, 353, 385, 416, 434, 543, 832, 847
 Blackberry Islets, 422
 Blackfish Sound, 601
 Blacklock Shoal, 998
 Black Warrior Lagoon, 195
 Blair Inlet, 528
 Blake Island, 337
 — Reef, 1145
 Blakeley Harbour, 336
 — Island, 353, 360
 Blakeney Islet, 524
 — Passage, 517
 — Port, 529
 Blanco del Mar, Piedra, 115
 Blanca de Tierra, Piedra, 115
 Blanca, Piedra, 93, 94, 105
 Blanca, Piedras, 141
 Blanco, Cape, 37, 847
 — Cape, and Light-house, 284-4
 — Fort, 242
 — Point and Bay, 196-7
 Blancos Isles, 103
 Blaney Island, 944
 Blaquiere, Point, 691
 Bligan, Cape, 744
 Bligh Island, 450, 645
 Blinai Islands, 669, 683
 Blind Bay, 363
 — Creek, 489
 — Entrance, 438
 — Reef, 434, 511
 Blinder Rock, 645
 Blinkinap Bay, 499
 Block Head, 644
 — Islets, 545
 Blonde, Point, 1075
 — Reef, 1074, 1075, 1076
 Blossom, Cape, 699
 — Reef, 1151, 1152
 — Rock, 122, 123, 126, 246
 — Shoals, 698, 700
 Bloxham Passage, 538
 Bloxham Island and Shoal, 537
 Blue Jay Cove, 574
 — Mountain, 266
 — Point, 567
 Bluff Point, 148, 197, 541, 546, 566

Blunden Bay, 515
 — Harbour, 503
 — Island, 367, 420
 — Point, 474
 Blunt, Cape, 557
 — Island and Light-house, 344, 352
 — Rocks, 267
 Blyde Berg, 746
 Blyling Sound, 649
 Boat Basin, 425
 — Cove, 527
 — Harbour, 501
 — River, 447
 Boatwain Bank, 375
 Bobrovaia Bay, 673
 Bobrovi Island, 706
 Bobrovoic, Sea of, 661
 Boca Barra, 86, 87
 Boca Chica, 7, 28, 98
 Rock Island, 964, 966
 Bodega Head and Bay, 248, 260-1, 263
 Bodisko Peninsula, 765
 Bolano Island, 28, 29
 Bolcherotak, 735, 743
 Bolchoireka, River, 743
 Bold Bluff, 376, 447
 Bolinas, 264
 Bolinas Islands, 574
 Bolina, Punta de la, 235
 Bolinas River, 211
 Bolshaya, River, 743
 Bomamri Islet, 755
 Bona Island, 17
 Bona Vista Island, 1049
 Bonanza Point, 166
 Bonaparte River, 454
 Bond Sound, 592
 Bonham Islands, 966-7
 Bonilla Island, 548
 Bonilla Island and Light-house, 344, 352
 — Point, 324, 405
 Bonin Islands, 1128-1136
 Bonita Channel, 251
 — Point, and Light-house, 241
 Bonnet Islet, 690
 — Rock, 914
 Bonpland, Point, 1021
 Boot Cove, 358
 — Island, 522
 Bordelaiso Island, 989, 990
 Bornabi Island, 979
 Borodino Isles, 1141
 Bosé sima, 803
 Bosphorus, Eastern, and Lights, 770-2
 Boston Islands, 561, 968
 Bottle Rock, 814
 Boudouse Island, 1016
 Boudrouet Rocks, 1157
 Bougainville, Mount, 1021
 Boughey Bay, 509
 Bouguenieu Island, 954
 Boulder Head and Ledge, 529
 — Point, 376, 500

Bouldyr Island, 669, 683
 Boundary Bay, 347
 Boungo Channel, 778-9, 787-8, 1185
 Bourdieu Bay, 652
 Bouronov Point, 630
 Boussie, 755
 Boussole Channel, 736, 739
 Bowen Island, 465, 481
 Bowyer Island, 482
 Boxer Reach, 533
 Boyarin Bay, 770
 Boyle Island, 510
 Boyles, Point, 503
 Boys Rock, 549
 Brace Point, 337
 Brackenridge Bluff, 317
 Bradfield Canal, 601
 Braithwaite Bay, 1030-1
 Brama, Point, 1021
 Branca, Piedras, 98
 Brandten Eyland, 844
 Brat Chirnoof Island, 739
 Brava Island, 27, 28
 — Point, 10, 19
 Breaker Islands and Ledge, 525
 Breaker Islets, 547
 — Point, 191
 — Point and Reef, 545
 — Rock, 787
 — Reef, 509
 Breakwater Point, 105
 Breezy Point, 566
 Brettell Point, 490
 Brithery Island, 538
 Bridge River, 461
 Bridget Point, 615
 Bright Island, 352
 — Islet, 511
 Brincanco Island, 23
 Bristol Bay and River, 591, 687-8
 British Columbia, Coast of, 350, 399, 454-568, 1169
 Brito, 48
 Britomart Reef, 1060
 Brocks Island, 926
 Brockton Point, 467
 Brodie Reef, 401
 — Rock, 546, 559
 Broken Channel, 420
 — Head, 774
 — Islands, 500, 843
 — Islets and Rocks, 413-14, 526
 — Point, 363
 Broken Water Bay, 1020
 Brood Rocks, 843
 Brook Harbour, 644
 Brooke Island, 564
 Brooks Islands, 1117-1122
 — Peninsula and Bay, 443-6
 — Shoal, 1112
 Brothy Ledge, 397, 400
 Brother Islets and Light, 248
 Brothers Islets, 1023

Brothers Point, 106
 ———— Rock, 732
 Broughton Bay, 1158-9, 1162
 ————, Cape, 866, 1183
 ———— Harbour and
 Island, 739
 ———— Island, 502
 ———— Point, 308
 ———— Rock, 844
 ———— Strait, 503-5
 Brown Channel, 774
 ———— Island, 356, 362
 ———— Islands, 964, 969
 ———— Passage, 558, 561
 ———— Point, 315
 Browne Island, 517
 Browning Bay, 105
 ———— Creek, 448
 ———— Harbour, 367
 ———— Passage, 423, 517
 ———— Rock, 500
 Bruce, Port, 709
 Bruin Bay, 585
 Bruja Island, 142
 ———— Point, 16, 98
 ———— Rock, 26
 Bruno Mountains, 238
 Bryant, Point, 647
 Bryce Channel, 490
 Brydono Island, 775
 Buache, Mount, 975
 Bucareli, Port, 605
 Buchon, Monte de, 228
 Buck, Point, 586
 Buckland Island, 1130, 1134
 ———— River, 699
 Bucksport, 270
 Budd Harbour, 330
 ———— Inlet, 339, 340
 Buena Point, 42
 Buenaventura, 216
 ———— River, 10,
 230, 233
 Buenos Jardines Islands,
 1127
 Buoy Bank, 6
 ———— Point, 14
 ———— Rock, 27
 Bufadero Rock, 93
 Bufadero Bluff, 96
 Buisako Islet, 827
 Bull Harbour, 507, 509
 ———— Passage, 485
 ———— Rock, 413, 449
 Bulley Bay, 531
 Bullock Bay, 776
 ———— Bluff, 489
 ———— Channel, 522
 Builtig Island, 1023
 Buna cima, 1128
 Bungalow Island, 1147
 Bunker Island, 926, 1114
 Bunkley Island, 996
 Bunsby Islands, 442
 Buoy Rock, 768
 Burdwood Bay, 492
 ———— Point, 429
 Burgess Islet, 420
 Burgoyne Bay, 376, 379

North Pacific.

Burial Islet, 376
 Burica Point, 30
 Burke Channel, 520-2
 Burnaby Island and Strait,
 573-5
 ———— Shoal, 467
 Burnt Hill, 448
 ———— Island, 677, 681
 Burntcliff Island, 553
 Burrard Inlet, 464-8
 Burrica Point, 30, 1257
 Burros, Los, 164
 Burrough Bay, 596
 Burrows Bay and Island,
 345
 ———— Island, 1124
 Burruc, Rio, 35
 Bush Islet, 547
 ———— Point, 333
 Bushy Island, 603
 Butaritari Island, 949
 Bute Inlet, 493-4
 Butterworth Rocks, 557
 Button Islands, 960
 Buyimawas, Cape, 871
 Busen, 795
 Byers Island, 1123
 Byki, Cape, 762
 Byron Bay, 1073
 ———— Island, 935, 940
 Caamano, Cape, 597
 Caballo Islet, 23
 Caballos, Puerto, 58
 Cabeza de Caballo Hills,
 120
 Cabra Bank, 17
 ———— Cerro de, 16
 Cabras Island, 1044
 Cacachilos Peaks, 172
 Cache Bay, 716
 Cacique Point, 42
 Cadboro Bay, 401
 ———— Point, 366, 403
 Cadiak, 655
 Cagaves Islet, 39
 Cahoon River, 288
 Caillie Point, 1021
 Calamahue Mountain, 147
 Calamity Bay, 547
 Calamujuet, 148
 Calandare Point, 126
 Calder, Mount, 603
 Caldern, 37, 38
 Caldwell Reef, 932
 California, Coast of, 204—
 276, 1169, 1175, 1176,
 1216, 1242, 1247
 ————, Discovery of Gold
 in, 205-6
 ————, Gulf of, 127-178
 ————, Lower, 127-9,
 130, 147-203
 Call Creek, 500
 Callam Bay, 327-8
 Callao, 1253, 1258, &c.
 Calm Channel, 490, 492-3,
 494
 ———— Point, 688

Calver, Cape, 396
 Calvert, Cape, and Island,
 518, 524
 ———— Islands, 957
 Calvillo, 145
 Camano Island, 342
 Camaron Point, 112, 131
 Camden, Port, 607
 Camichin, Estero, 120
 Camira Island, 1125
 Cammas Plains, 311
 Camp Bay, 368
 ———— Cove, 363
 ———— Island, 491
 ———— Islet, 544
 ———— Point, 498, 523, 535,
 537, 566, 617
 Campania Sound and
 Island, 543, 544
 Campbell Island, 524, 526
 ————, Point, 654
 ———— Reef, 989
 Camuta, Rio, 103
 Campeche Bay, 85
 Canaveral, Port, 547
 Canal Island, 20
 Canas Island, 9
 Candelillo, Point, 63, 65
 Candeleros Point and Rocks,
 161
 Cano Island, 35, 36
 Canoas Point, 197
 Canoe Flat, 563
 ———— Island, 359
 ———— Islet, 386, 546
 ———— Passage, 557
 ———— Reef, 424
 ———— Rock, 518
 ———— Rocks, 373
 Cantada Islet, 147
 Canute Bay, 103
 Caoba, Rio, 74
 Capalita, River, 93
 Capo Island, 630
 ———— Islet, 558
 Capenier Island, 960
 Capero, Sierra, 17
 Caplin Island, 995
 Capper Island, 1108
 Capetan Head, 1151
 ———— Island, 415
 Captain Bank, 799
 ———— Bay, 672-3
 ———— Island, 487
 ———— Passage, 380
 Caraculito Islet, 62
 Carapollas Island, 1011
 Cardena Bay, 538
 Cardero Channel, 407
 Cardon Channel, 54
 ———— Island, Head, and
 Light, 51-2, 53, 54, 56
 Cardonal Inlet, 167
 Carreen Creek, 359
 Carey Island, 27
 Cariboo Goldfields, 455
 Carmel Bay and Point,
 231
 Carmelo, Brazo de, 481

- Carmen Island, 161-2, 169
 Carmin, Entrada de N. S. del, 608
 Carolina Channel, 418
 — Island, 970
 Caroline Islands, 937, 970—
 1008, 1190
 — Reef, 403
 Carpenter Bay, 573
 Carr Bank, 763
 — Inlet, 339
 — Islet, 561
 Carré Island, 27
 Carrera de los Viejos, 173
 Carrington Bay, 490, 491
 — Reefs, 524
 Cartago, 38
 — Volcano, 3
 Carter Bay, 531-2
 Carteret Reef, 1025
 Cartwright Sound, 586
 Casan Bay, 600
 Casares, 48
 Casaya Island, 7, 8
 Cascade Bay, 364
 — Canal, 522
 — Head, 293
 — Mountains, 455
 Cascades, The, 298, 310
 Case Inlet, 339
 Cascoos Islands, 969
 Casparino, Point, 179
 Cassini Island, 767
 Castanon Islands and Bluff,
 51, 62
 Castello, Point, 216
 Castillos, Villa de los, 122
 Castle Point, 511, 774
 — Rock, 1132, 1133
 Castricum, Cape, 740
 Castris Bay & Lighthouse,
 767, 763-4
 — Point, 763
 Catala Island, 436
 Catalan Banks, 1044
 Catalina Harbour, 221
 — Point, 41
 Cat-face Mountains, 421
 Catharine Islands, 964, 965
 Catherine, Cape, 767, 764
 Cathlamet Point, 398
 Cattle Islands, 506
 Caution, Cape, 514
 — Point, 357
 Cavallos, Punta de los, 247
 Cayado, Cape, and Hills, 24
 Cayo Inlet, 165
 Cebaco Island, 18
 Central America, Coast of,
 1—80
 Cecil Patch, 538
 — Rock, 374, 379
 Cécille Archipelago, 1145
 Cedros Island, 192
 Celia Reef, 373
 Celilo, 310
 Ceniza, Mount, 200
 Cenizas Island, 199
 Centre Reef, 369, 386, 418
 Centro Island, 482, 568, 566,
 575, 827
 — Rock, 403, 480
 Cersibo Island, 172-3
 Cersivo, 128
 Cersy Peak, 1019
 Cerros Island, 192-4
 Cetti Bay, 1044
 Chabrol Harbour, 977
 Chacktole Bay, 692
 Cha-cho-Kwas Islands, 513
 Chacota Bay, 112
 Chacon, Cape de, 599
 Chagamil Is., 676
 Chagavka Cove, 656
 Chagres, Rio, 13
 Chain Islands, 380, 413
 — Islets, 402
 Chaktolmout Bay, 692
 Chalatenango, 65
 Chalan Amiti, Cape, 1043
 Challenger Cove, 1021
 Chalmers Anchorage, 538
 — Port, 618
 Chalque Island, 586
 Chamatia River and Hills,
 128
 Chamé Bay, Island, and
 Point, 16-17
 Chameia, 109
 Chamis Bay, 440
 Chamisso Island, 699
 — Port, 991, 992
 Champenco, 89
 Chanceller Channel, 499
 Channel Muff, 876
 — Islands, 559
 — Islands and Rock,
 541
 — Islet, 419
 — Islets, 380, 486, 549
 — Point, 403, 1012
 — Reef, 412, 416, 436,
 515, 543
 — Reefs, 445
 — Rock, 395, 414, 416,
 500, 1163
 — Rocks, 407, 408, 411,
 439
 Chapera Island, 8
 Chaplin, Cape, 714
 Charco Azul, 29
 Charles Island, 349, 383
 — Point, 623
 — Rocks, 381
 Charlotte Island, 937, 948
 Charybdis Rock, 853
 Chase Lodge, 273
 Chasintsoff, 600
 Chasent Island, 993
 Chat - Channel Point, 438,
 440
 Chatham Bay, 924, 925
 — Channel, 500
 — Islands, 403, 958
 — Mount, 331
 — Point, 497
 — Port, 619—650
 — Sound, 549—560
 Chatham Strait, 606, 612-13,
 620, 628
 Chatlem, 596
 Cheek-Squints, 528
 Cheerful, Cape, 673
 Chehalis, Port, 315
 — River, 311, 317
 Chelickoff Strait, 655, 660
 Chemainos Bay, 376, 377
 Chepillo Island, 11
 Chepo River, 11
 Cheponskoi, Cape, 729
 Choquetan, 103
 Chernobour Island, 667
 Chetakhoff Islet, 686
 Chester Islets, 194
 Chet-ko River and Bay, 280
 Chetyrek Point, 775, 776
 Chevelutch Mountain, 728
 Chi-a-aki, 881
 Chiapas, 80
 Chiboko, 702
 Chicapa River, 86
 Chicarene Point, 60
 Chichagoff Island, 619, 627
 Chichakoff, Cape, 784
 Chichaldinskoi Volcano,
 670
 Chichkoff, Cape, 670
 Chief Rock, 441
 Chihuahua, 130, 135
 Chik-lu-ik Point, 312
 Chilcat Inlet, River, and
 Island, 614, 616-17
 — Point and Peak, 617
 Chilcoat Inlet, 614, 617
 Chimalapa River, 86
 Chimaltenango, 3
 Chiman River, 10
 Chimney Bay, 29
 Chimney Rock, 913, 1154,
 1156
 China, 1244, 1257, 1260,
 1265
 Chincho Bay and Islet, 21,
 22
 Chinondaga, 53
 Chinitokoy Bay and Cape,
 656-9
 Chinoia River, 317
 Chinoek Point and Spit,
 304, 305
 Chiroto River, 1043
 Chipegua Bay and Point,
 88-89
 Chipse Island, 8
 Churin-botan Island, 738
 Chiriquin Point, 60, 64
 Chiriqui Bay, 27-28
 Chirnoi Island, 739
 — Brothers Island, 739
 Chismore Passage, 538
 Chismuyo Bay, 68
 Chiswell Isles, 648, 649
 Chivato Point, 154
 Choco Bay, 1170
 Choked Passage, 525
 Cholla Islet, 161
 Cholmondale Sound, 600

606, 612-13,
828
672
315
311, 317
665, 666
376, 377
11
1
Cape, 729
and, 667
686
194
and Bay, 280
775, 776
ountain, 728
56
60
d, 619, 627
6, 784
Volcano,
679
135
nt, 312
River, and
516-17
d Peak, 617
514, 617
r, 86
3
10
913, 1154,
257, 1260,
1 Islet, 21,
and Cape,
17
and Spit,
043
and Point,
nd, 738
60, 64
28
19
aland, 739
638
8, 649
4
525
and, 600

Choluteca, Rio, 3
Chomé Island, 766
Choncha Pelona Rock, 34
Chontales, 60
Chosai, 849
Choris Peninsula, 699
Choukotaki, Cape, 714
Choumaguine Islands, 666
Chramtchenko Islands, 966
Christian Island, 884
—— Sound, 606-7, 612
Christie Islets, 549
—— Passage, 568
Christmas Harbour, 958
—— Island, 926-8
Chroustcheff, Cape, 575
Chuchamone Peak, 132
Chuchegal, Ensenada de, 27
Chuchican, Ensenada de,
57
Chuchunague River, 7
Chuenque Bay, 160
Chugachnik Bay, 651-2
Chuginadak Island, 676
Chung-chi Island, 1157,
1161, 1260
Chupigana, 6, 7
Church, Cape, 394
Chuuk Island, 868
Chus Island, 136
Cierro Island, 122, 123
Cinaloa, Rio de, 134
Clasnet, 278
Clallum, Point, 331
Clam Bay, 376, 383, 386
Clan-ninick Harbour, 437,
440-441
Clara Islet, 441
Clarence Island, 147
—— Port, 606-7
Clarion Island, 1032
Clark, 295
—— Island, 354
—— River, 305
Claro, Rio, 40
Clasnet, Caps, and Light-
house, 325-6
Clatsop Beach, Spit, and
Channel, 301, 303
Clayquot Sound, 404, 419
—— 425
Cloare, Cape, 647
Cleft Island, 607
Clémentia Reef, 358, 366
Cléopâtre Island, 1146
Cleopha Island, 112
Clerk Island, 941, 943
Clarke Island, 792
—— Reefs, 443-4
Cliff Island, 530
—— Islet, 546
—— Point, 548, 562, 567
CLIMATE:—
Alaska, 592-3
British Columbia, 456-7,
1169
Caroline Archipelago,
972-5
Central America, 4-5

CLIMATE—continued.
Cocos Island, 925
Commander Islands, 723
Gilbert Archipelago, 938-9
Guaymas, 139
Japan, 770-782
Kamchatka, 725
Kodiak, 655
La Paz, 169
Mariana Islands, 1039-
1041
Mazatlan, 122-3
Mexico, West Coast, 83-5
Oregon, 279
Prybilov Islands, 705
Queen Charlotte Islands,
579
San Blas, 115, 118-120
San Francisco, 252-4
Sandwich Islands, 1067-8
Tartary, Gulf of, 757-8
Vancouver Island, 389-399
Vladivostok, 771-2
Washington Territory,
279
Clio Bay, 534
—— Rock, 97
Clipperton Island, 1028-9,
1202
Cloak Bay, 585
Cloud Island, 1032
Clover Point, 400, 401
Clown Rock, 547
Clump Hill, 794
Cluster Reefs, 516
Coal Deposits, 12, 28, 67,
136, 336, 346, 389, 466,
471, 539, 570, 580, 667,
671, 700, 749, 760, 768,
817, 863, 870, 899, 907
Coal Bay, 651
—— Harbour, 450, 451, 464,
465, 466-7, 667
—— Island, 373
—— Point, 283, 374
Coaleman, Rio, 103
Coast Mound, 559
—— Nipple, 514
Coaster Channel, 414
Cobre, Arroyo del, 22
Cochori Beach, 136, 138
Cochran, Cape, 786
—— Point, 645
Cocina Island, 109
Cockburn, Cape, 487
Cocoa-nut Cove and Light,
1074, 1075
—— Island, 1074
Cocos Bay, 42
—— Island, 924-5, 1042,
1217, 1257
—— Point, 9
Cod Reefs, 529
Codfish Rock, 525
Coeran Passage, 1017
Coffin Harbour, 1128, 1135,
1136
—— Islet, 377, 449
—— Mount, and Rock, 308

Coffin Rock, 191
Coghlan Anchorage, 535
—— Rock, 559
Coila Island, 10-20
Cojutepeque, 70
Coke, Point, 610
Cold Bay, 660
Colima, 81, 104, 105, 106
—— Volcano, 82, 104,
106
Collingwood Channel, 482
Collison Bay, 573
Colnett, Cape, and Bay, 200
—— Island, 881
—— Strait, 1145
Colombia, United States of,
Coast of, 1, 6-31
Colon, 13
Colorado, 134
—— Island, 109
—— Punta, 110
Colorado, Corro, 176
—— Morro, 111
—— Peak, 155
—— Point, 6, 155, 158,
162, 169
—— Rio, 129, 146-7
Colpoys, Point, 603
Colton, 210
Columbia River, 278, 297
—— 310
Column Peak, 11
Colville, Cape, and Island,
345, 352
Colville, Port, 310
Colvos Passage, 337
—— Reefs, 340
Colwood Farm, 399
—— Islet, 433
Comanda, 160
—— Boca de, 186
Comayagua, 3
Comber Rock, 519
Commander Islands, 721
Commencement Bay, 337-8
Commorrell, Cape, 508, 512
Commerson Island, 1016
Comox, 475
Company Island, 740
Compton Island, 561
Comptroller Bay, 642
Comte Heiden Bay, 686
Concepcion, Point, and
Bay, 155, 157
—— Point, and
Lighthouse, 217, 1175
—— Sierra, 217
Conchagua, 60, 61
—— Gulf of, 3, 57-64
—— Volcano, 68
Conchagua Island, 58
Conclusion Island, 604
—— Port, 619-620
Conconi Reef, 368
Concorlin, 45, 65, 68
Cone Island, 425, 531
—— Islet, 545, 1155
—— Islet and Lighthouse,
882

- Cone Mountain, 541
 — Point, 196
 — Rock, 272, 392
 Conejo Bay, 88
 — Island, 25
 — Point, 181
 Congo, Cerro, 9
 Congreas Island, 1126
 Conical Islet, 867
 Connel Islands, 559
 Connis Rocks, 549, 560
 Cono Islet, 21
 Conqueror Bank, 800
 Conag Rock, 147
 Conspicuous Bluff, 865
 Guntance Bank, 404
 — Cove, 397, 398
 — Mount, 341
 Constantin Island, 988
 Constantine Bay, 672, 748
 — Cape, 688
 — Harbour, 644,
 682
 — Port, 1019
 Constitution, Mount, 362
 Contadora Island and
 Channel, 7, 8
 Contra Costa Mountains,
 240
 Contreras Islets, 23
 Conzaco Peak, 429, 431
 Conversion, Point, 215
 Conway Reef, 43, 55
 Cook Anchorage, 1104-6
 — Cape, 406, 443
 — Islet, 591, 660-4, 1179
 — Island, 927, 928, 947
 — Point, 1082
 Cooper Inlet, 893, 923
 — Island or Breakers,
 1108
 — Islets, 1146
 — Reef, 374
 Copalis River, 317-8
 Copalux River, 214
 Copper Bay, 578
 — Island, 408, 583, 721,
 722-3, 1108
 — Islands, 574
 — River, 642
 Coquille Harbour, 976, 977
 — Islands, 967
 — Islet, 999
 — River, 285
*Coral Islands and Reefs,
 Structures, Growth, &c.,
 918-922*
 Coral, Reefs, 1033
 Corcovado Rock, 34
 Cordell Bank, 263, 266-7
 Cordova Bay, 606
 — Channel, 365, 372
 — Port, 606, 644
 Correa Strait, 783
 Corinto Island, 51
 — Port, 3, 45, 50, 51-7
 Cormorant Bay, 366
 — Island, 504
 — Rock, 506
 Cornwallis Bay, 1036
 — Islands, 1033
 — Point, 607
 Coronados Island, 159
 — Islands, 169
 — Islets and Rocks,
 203
 Coronation Island, 605
 Corral Tierra, Punta de,
 236
 Corrales Harbour, 111
 Corrientes, Cape, 110, 118,
 1217
 Corro Island and Harbour,
 1012-13
 Corso, Cape, 185
 Cortes Island, 489, 490
 — Sea of, 129
 — Shoal, 219-220
 Cortes, Puerto, 58
 Coruma Island, 1160, 1161
 Corvallis, 291
 Corvetana Rock, 112
 Coscia, 132
 Cosaguina, Gulf of, 57
 — Point, 59
 — Volcano, 3, 51,
 58, 59
 Costa del Balsamo, 70
 — Rica, Coast of, 1, 3, 5,
 31-44, 1172
 — Rock, 888, 914
 — Tosa, 49
 Costello Reef, 990
 Coto, Rio, 32, 34
 Cottam Reef, 475
 Cougnak Island, 653
 Count Heiden Islands, 959
 Countess, Point, 646
 Coupeville, 343
 Courtenay River, 476, 478
 Courverden, Point, 614,
 621
 Cove Bay, 651
 Coveland, 343
 Covell Islands, 908
 Covey Island, 885
 Cowell Islands, 968
 Cowgitz, 580
 Cowitchin Harbour, 372,
 373
 Cowlitz Bay, 366, 371
 — River, 308
 Cox Island, 513
 — Point, 419, 545
 Coyote Bay, 157
 — Point, 160, 168, 170
 — Rocks, 166
 Coyuca, Paps of, 99, 100,
 101, 102
 Cozian Rock, 628
 Cracraft Island, 509, 501
 Craig Channel, 154
 — Point, 602
 Crane Islets, 510
 — Shoal, 932
 Cranstown Point, 518
 Crasay, Cape, 774
 Crescent Bay, 322, 328
 Crescent City Bay and
 Lighthouse, 267, 273-4
 — Rocks, 278
 — Inlet, 576
 — Point, 379
 Cresciente Island, 181
 Crespo Island, 1124
 Creston Island and Light,
 121, 123, 126
 Cridge Islands, 551
 — Passage, 544
 Crillon, Cape, and Light-
 house, 755-4
 — Mount, 625, 635
 Crispin Rock, 367
 Croisilles, Cape, 1019
 Cromwell, Mount, 1018
 Crooks Point, 280
 Croose Island, 619
 Crose, Cape, 625
 — Islet, 666
 — Point, 529
 — Sound, 619, 621-5
 Crown Island, 1019
 — Islet, 361
 Crosser, Mount, 976
 Cruice Rock, 539
 Cruz Lagoon, 141
 Crucial Peak and Point,
 96, 97
 Cualcoman, 104
 Cucharrillas Reef, 110
 Cuchilla Grande, 264
 Culebra, 14
 — Port, 42
 Culiacan and River, 130,
 132-4
 Calrose Point, 646
 Cumbra de las Auras
 Mountain, 237
 Cumming, Point, 534
 Cumshewa Inlet, Islet, and
 Rocks, 578
 Cunningham Islands, 524
 — Passage, 554
 Cuop Islands, 995
 Curr Island, 1122-3
 Current Island, 1026
CURRENTS, 1194-1218
 General Remarks, 1194;
 North Equatorial Cur-
 rent, 1195-7; Equa-
 torial Counter-Current,
 1197-1202; The Kuro
 Siwo, or Japanese Cur-
 rent, 1203-12; The
 Oya Siwo, 1212; Kam-
 chatka Current, 1212;
 Sea of Japan, 1213;
 Sea of Okhotsk, 1213;
 Behring Sea, 1214;
 Coast of California,
 &c., 1216; West Coast
 of Mexico, 1217
 Alaska, Coast of, 639,
 1180
 — Current, 1212,
 1216

Bay and
267, 373-4
Rocks, 276
676
379
nd, 181
1124
and Light,
551
544
and Light-
625, 638
67
1019
nt, 1018
80
319
6
6
29
19, 621-6
4, 1019
1
976
9
41
and Point,
7, 110
6, 254
2
River, 130,
46
las Auras
7
t, 534
t, Islet, and
lands, 524
ango, 554
96
73-3
1026
-1218
arks, 1194;
torial Cur-
7; Equa-
er-Current,
The Kuro
anese Cur-
-12; The
112; Kam-
ent, 1212;
an, 1213;
tak, 1213;
an, 1214;
California,
West Coast
217
of, 639,
ent, 1212,

CURRENTS—continued.

Aleutian Islands, 1212
Baker Island, 933
California, Coast of, 1216
—, Gulf of, 131
Caroline Archipelago, 974,
975
Central America, 5
Flourieu's Whirlpool,
1217
Gilbert Archipelago, 939,
1200
Helen Reef, 1025-6
Japan Stream or Current
(see Kuro Siwo, below).
Kamchatka Current, 917,
1212, 1214
Kodiak, 1211
Kurile Current, 1214
Kuro Siwo, The, 592,
782, 832, 842, 854, 916-
917, 1147, 1169, 1203-
1212
La Pérouse Strait, 757
Lower California, West
Coast, 178-9
Lu-chu Islands, 1147
Mariana Islands, 1040,
1041, 1196
Marshall Archipelago,
952, 1200
Mexico, West Coast of,
1217
Oya Siwo, The, 554, 1212,
1214
Queen Charlotte Ida., 571
Sandwich Islands, 1068-9
Tartary, Gulf of, 1213
Taugar Strait, 855, 1213
Vancouver Island, 390-2
Currie Channel, 770
Curtis Point and Rock, 545
Custodios River and Point,
112
Custom House Point, 522
Cuttle Islets and Rocks, 442
Cuvier Harbour, 224, 226
Cyclops Mountains, 1021
Cyprus Bay, 421
—, Island & Reef, 345-6
—, Point, 230, 231
Dradinas Passage, 506
Daguet Island, 915
Daibo saki, 831
Daibutsu sama Statue, 836
Daiko mura, 896
Daikoku sima, 864, 865
Daito saki, 849
Daleo Point, 337
Dalveron Islet, 769
Dall Patch, 629
Dallas Bank, 331
—, Mount, 370
Dallies, The, 319
Dallas Island, 606
Daimi Point and Light, 730
Dalrymple, Cape, 752
Damas Bay, 19, 20

Dames, Port de, 20
Dampier Island, 1019-20
—, Strait, 1018
Dana Inlet, 577
Danaide Rocks, 15
Danéono Island, 1042
Danger Island, 1035
—, Islands, 969
—, Islet, 1024
—, Patch, 532
—, Point, 613
—, Reef, 376, 378
—, Rock, 357, 371, 412,
415, 433, 763
—, R. Is., 447, 450, 451,
573
—, Shoal, 369, 514
Dangerous Point, 651
—, Rock, 764, 755
Daniel Islands, 955
D'Anville Gulf, 767
De la Roche Island, 161, 169
Darby, Cape, 694
Darrien Harbour, 6-7
—, Isthmus of, 1
Dark Cove, 487
—, Island, 422
Darker Island, 1125
Dart Reefs, 1019
Darwin Sound, 575, 576
D'Assas Point, 764
Davenport Point, 536
David Bay, 27-8, 29
—, Channel, 417
Davidson Rock, 345, 352
Davis Bay, 352
—, Island, 931
Davison, Point, 599
Davydoff Island, 682
Dawson Island, 961
—, Point, 535
Day, Point, 527
Deadman Island, 212, 213
—, Islet, 546
Dead Tree Point, 579
Dean Canal, 522
Deans Dundas, Port, 770
Dease's Lake, 602
Decapolis Reef, 989
Decatur Island, 353, 360
Deception Channel, 421
—, Islet, 344
—, Pass, 422
—, Passage, 343, 344
Deciorta Island, 1125
Decision, Cape, 605, 606, 612
Deckers Island, 1110
De Courcy Islands, 387
Deep Bay, 476, 528, 627,
1150, 1153
—, Cove, 375, 482
—, Inlet, 439
—, Pass, 421
—, Sea Bluff, 502
Deep-water Bay, 496
Deer Harbour, 362, 363
—, Island, 28, 121, 506,
524
—, Islands, 408, 412, 415

Deer Lagoon, 334
—, Moand, 552
Defiance, Point, 338
De Fuca's Pillar, 326
Deger, Cape, 768
De Horsey Island, 540
Deik Island, 1124
Délaroff Island, 681
Delaravskoi Bay, 667
Delaware Bank, 1116
Delgada Point, 183
De-lisle, Cape, 751
Deluge Point, 573
Denbigh, Cape, 692, 694
Denges Passage, 1014
Denman Island, 473, 475-6,
477
Dennis Rock, 345
Denny Island, 523
—, Rock, 516
DENSITY of Ocean Water,
1230-31
Dent, Cape, 763
Departure Bay, 471-3
DEPTH of the Ocean, 1232-3
Derbinskoi Strait, 671
Dorby, 461, 464
Descanso Point and Bay,
202
Descartes, Point, 43
Deschnev, Cape, 708
Deserted Bay, 487
—, Creek, 431
Desgraciada Island, 1062
Desima, 903
Desolada, Cape, 48
Desolation Sound, 489-490
Despenas Island, 43
Destitution, Cape, 762
Destruction Island, 319
Devastation Channel, 523
—, Island, 551
Devil Rock, 515, 1135
Devils Point, 541
Devil's Ridge, 593-9
—, Thumb Mountain,
609
De Vries, Cape, 853
—, Strait and Cape,
740, 741
Dewey Channel, 192
Deyea River, 617
Destima Island, 777
Diablo, Point, 170, 244, 1046
Diamante Point, 101
—, Shoal, 98
Diamond, Cape, 827
—, Hill, 1097
—, Point, 364
Diana Island, 408
—, Shoal, 932
—, Strait, 739
Dick, Mount, 485
—, Port, 649
Dickens Point, 566
Dickenson Point, 605
Digby Island, 551
Digges Sound or Bay, 636,
637

Diggs Point, 147
 Dillon Point and Rock, 507
 Dimple Point, 547
 Dinner Point, 368
 Dino yama, 802
 Diomed Islands, 698, 708
 Diomedes Inlet, 772
 Dionysius, Mount, 715
 Direction Bluff, 733
 —, Mount, 708
 —, Sand-hill, 144

DIRECTIONS:—

Amur, Gulf of, and River, 766
 Avatcha Bay, 731-4
 Barclay Sound, 411, 415-416
 Bellingham Bay, 347
 Bingo Nada, 800
 Broughton Strait, 505
 Castrics Bay, 764
 Clayoquot Sound, 425
 Columbia River, 303-4
 Discovery Passage, 497-8
 Esperanza Inlet, 436-7
 Georgia, Strait of, 480-1
 Hakodate, 860
 Harima Nada, 805
 Haro Strait, 365-6
 Hesquiat Harbour, 426
 Hilo Bay, 1074-7
 Hiogo Bay, 808
 Hirado no seto, 889
 Honolulu, 1097-9
 Johnstone Strait, 501
 Juan de Fuca Strait, 324-3
 Kil Channel, 815
 Kurusima no seto, 798
 Kynquod Sound, 440
 Lloyd, Port, 1132-33
 Meisoo-sima Islands, 1161-2
 Middle Haro Channel, 355-6
 Milbank Sound, 527
 Nagasaki, 905-6
 Nagasaki to Simonoseki, 913-15
 Nanao Harbour, 876
 Nanaimo Harbour, 470
 Napha-kiang, 1152-3
 Nootka Sound, 431-2
 Nuchatlits Inlet, 433-4
 Oo sima Harbour, 816
 Owari Bay, 821
 Panama, 15-16
 Portier Pass, 385-6
 Quintaine Sound, 450-2
 St. Paul Harbour, 658-9
 St. Vincent Channel, 800
 San Francisco Harbour, 250-53
 Simoda Harbour, 828-9
 Simonoseki Strait, 793-6
 Sitka Sound, 631-2
 Skidgate Inlet, 580-81
 Spex Strait, 889
 Sutil Channel, 492
 Suwo Nada, 795-6

DIRECTIONS—continued.

Trincomalle Channel, 384-5
 Taugar Strait, 861-2
 Uraga Channel, 840, 841
 Yedo Bay, 840
 Yedo, Gulf of, 832-3, 839-840, 848
 Yedo to Taugar Strait, 834
 Yokohama, 840
 Disappointment, Cape, 757, 761, 776
 —, Cape, and Lighthouse, 301-2
 —, Island, 1139
 Disaster Island, 1145
 Discovery Island, 492, 690
 —, Passage, 322, 494-8
 —, Port, 330-31
 —, Rocks, 827
 Disney Point, 357, 371
 DIsraeli, Mount, 1018
 —, Mountains, 567
 Dispensa Point, 167
 Disposition Island, 58
 Distant Island, 628
 Dixie Cove, 439
 Dixon Channel, 568
 —, Entrance, 560-61
 —, Island, 547
 Diyi sima, 808
 Djaore, Cape, 766
 Djino sima, 812
 Djino hana, 801
 Doble, Punta, 140
 Dockyard Island, 449
 Dodd Narrows, 365, 376, 386-7, 473
 —, Passage, 555
 —, Rock, 554
 Dodger Cove, 411, 412
 Dodo Passage, 956
 —, Rocks, 853
 Dog Island, 577, 944
 Dogfish Bay, 565
 Dog-salmon River, 617
 Dolomite Narrows, 574
 Dolores Bay and Point, 164
 —, Isla de, 319
 —, Island, 1140
 Dolphin Island, 549
 —, Point, 337
 Domakura aki, 818
 Dome Peak, 566
 Dominical Point, 36
 Don Ledge, 545
 —, Point, 541
 Dona Maria Lazara Island, 1108
 —, Paula, Estero, 51
 Donegal Head, 505
 Dora Reef, 583
 Dorei, Dorei, or Dory, Port, 1024
 Do-sima, 886
 Double Bluff, 333, 334
 —, Head, 806

Double Island, 418, 422, 438, 913

—, Islet, 444
 —, Islet Point, 563
 —, Peak, 148
 —, Rocks, 816
 Double-headed Rocks, 295
 Double-topped Mountain, 1154
 Dougandaha, Cape, 748
 Dougangea, Cape, 747
 Douglas, Cape, 650, 652, 660
 —, Channel, 357, 534
 —, Harbour, 588
 —, Island, 606, 611-12
 —, Mount, 366
 —, Reef, 1138, 1139-40
 Dournovo Islet, 769
 Dove Reef, 882, 914
 Dowager Island, 527, 529, 531
 Downes, Point, 479
 Downs Point, 751
 Downst Reef, 1113
 Doyle Island, 508, 510
 Dragon Rocks, 275
 Drake Bay, 204, 231, 255
 Drake's Island, 1115
 Drayton Harbour, 348
 Drew Harbour, 490, 491
 —, Rock, 368
 Drovianata Cove, 675
 Drummond Island, 936, 941
 Drury Islet, 503
 Dry Bay, 636
 —, Island, 1123
 Ducie Island, 559
 Duck Island, 747
 Dudemaine Island, 1020
 Duff, Point, 502
 Duga, Cape, 763
 Dugay Trouin Reef, 1061
 Dui and Lighthouse, 730, 757, 760, 1184
 Duke of Clarence Strait, 595, 598-604, 605
 —, York Islands, 598, 600
 Dulce, Gulf of, 32-4, 1257
 —, River, 97
 Duma, Point, 214
 Duncan Bay, 496, 497, 552
 —, Canal, 602
 —, Island, 608, 925
 —, Rock, 322, 326
 Duncan's Mills, 218, 262
 Dundas Bay and Point, 623
 —, Island, 945, 1145
 —, Islands, 659
 Dunkin Reef, 990
 Duntze Head, 397, 398
 —, Island, 339
 —, Rock, 322, 325
 Duperré, Cape, 1018
 Duperry Island, 990
 —, Isles, 978
 Du Petit Thouars Shoal, 183
 Durango, 130

18, 422, 436,
4
int, 563
18
18
Rocks, 295
Mountain,

pe, 748
6, 747
50, 652, 660
367, 534
588
06, 611-12
66
8, 1139-40
69
014
627, 629,

79
3
510
5
51, 255
15
348
0, 491
675
936, 941

1020
7, 1061
se, 750,
Strait,
05
nds, 698,
1257

7, 552
923
26
262
nt, 623
145

8
3
shoal,

Durour Island, 9017
D'Urville Island, 991, 1020
Point, 1022
Dutch Bay, 673
Duval Point, 507
Duwamish Bay and Light-
house, 335-6
Head and River,
335
Duxbury Point and Reef,
254
Dyke Point, 397, 398
Dzinostetti Channel, 809
Eagle Harbour, 336
Island, 339
Eap Island, 1005-7
Ear Island, 1005
Earakong Island, 1011,
1013
Earl Dalhousie Shoal, 1003
Lake, 275
Ledge, 499
Ears Islet, 1130
East Bay, 892
Cape, 698, 708
Entrance Reef, 438
Fain Island, 996
Foreland, 653
Passage, 449
Point, 458, 572
Rock, 442, 525
Sound, 362, 363-4
Eastern Bosphorus and
Lights, 770-2
Easy Creek, 438, 440
Eauripik Islets, 1003
Ebadon Island, 965
Ebeko, Mount, 737
Ebisima, 814
Ebisu jima, 806
Ebon Islands, 962, 968
Echo Harbour, 576, 577
Eckholm Islet, 631
Eclipse Island, 543
Ecota Creek, 296
Eda yama, 817
Eden Island, 502
Edenaw Point, 584
Edgecumbe, Cape, and
Mount, 619, 628, 631, 633
Ediz Hook and Light, 328,
329
Edmund, Point, 520
Edward, Cape, 625
Point, 522
Reef, 516
Edye Passage, 560, 557-8
Eel Reef, 504
River, 268
Effingham Inlet, 415
Egg Island, 693, 1106
Island and Rocks, 515-
516
Islets, 674
Egerup Islands, 958
Egmedio Island, 938
Egorkovskoi, 675
Egvekinot Bay, 718

Eidannoo, 697
El Malk Island, 1011,
1013-14
Eirek Island, 963
Eject Island, 955
Ekarma Island, 738
Elato Islands, 1000
Elbow Islet and Rocks, 414
El Coto, 218
Eld Inlet, 339
Island, 315
Eleanor Cove, 637
Point, 379
Elena, Cape, and Bay, 43
Elide Island, 196
Eliza Dome, 437
Island, 347, 940
Port, 434, 435-6
Elizabeth, Cape, 649, 750,
1213
Island and Rock,
538
Islands, 967
and Henry Reef,
1156
El Jaco Point, 26, 27
Elk Bay, 496, 497
City, 291
Creek, 296
River, 270, 283
Ella Island, 1001
Ellen Bay, 381
Island, 572
Ellenburg, 281
Ellice, Point, 305
Elliot Bay, 336
Elliott Island, 538
Point, 562
Ellis, Point, 305, 607
Reef, 882, 914
Elmore Islands, 966
Elmstone Rock, 834, 840
Elota and River, 132
Elpyngbyn Mountain, 172
Erington, Point, 646
Elwha, River, 328
Emerings, 1012
Emma Harbour, 716
Passage, 561
Emmelagui, 1012
Empire City, 287
Ena gawa, 807
Eni Hill, 546, 805
Enderby Islands and Bank,
998
Endermo Harbour and
Light, 863, 864
Endicott River, 615
Endungomo Cove, 758
Engano, Cabo del, 628
Engaoughin Bay, 719
English Bay, 465-6
Harbour, 929
Enguae Island, 702
Eniwetok Islands, 969
Ennelian, Cape, 717
Ensenada Point, 201-2
Ensalada Islands, 2
Enterprise Reef, 381

Enterprise Channel, 401
Reefs, 368
Entrada Point, 182, 198
Entrance Anchorage, 408,
411
Bank, 495
Head, 791
Island, 412, 447,
542, 621, 630, 632
Island and Light-
house, 469
Islet, 577, 946
Mountains, 446,
447
Point, 612, 622,
651
Reef, 435, 558
Rock, 474
Shoal, 360
Entry Cone, 518
Peak, 561
Enybarber Island, 962
Enylameej Island, 964
Eourpyg Islets, 1003
Epiphany Bay, 659
Equipalito Rock, 155
Erabou Island, 1161
Eremitance Islands, 1016-17
Erie, Mount, 346
Erikub Islands, 952, 958
Errakong Island, 1013-14
Erratai, Cape, 847, 818
Eru Island, 965
Esarmi, Cape, 857, 863
Escape Point, 597
Reef, 376, 377, 500
Reefs, 553
Eschevan Island, 89
Eschscholtz Basin, 699
Islands, 963
Esclavos, Rio dos, 74
Escundido, Puerto, 141,
160, 169
Escuinla, 78
Esparta, 38
Espartal Island, 26
Espanburg, Cape, 699
Esperanza Inlet, 434-7
Sound, 404
Espinoza Arm, 436
Espiritu Santo, Barra del,
67
Island, 166-
167
Espuela Island, 21
Esquimalt Harbour, 397-
399
Esquinas, Rio de las, 33
Eslington, Fort, 539, 540
Esating, Baie d', 759
Estapa and Island, 102, 103
Estero Anchorage, 38, 39
Esteros Bay and Point, 229
Estevan Island, Sound, and
Lodge, 544-5
Point, 426, 428,
429
Ester Island, 645
Estiva Island, 17

- Etal Islands, 991, 993
 Etches, Port, 643-4
 Etmoi Point, 630
 Etolina, Cape, and Strait, 688, 690
 — Harbour, 601
 — Island, 603
 Etolkouim Bay, 718-9
 Ettrick Rock, 660
 Eugene City, 309
 Eugénie Archipelago, 770
 Euphrosyne Rock, 1138, 1139
 Eureka, 270
 Euryalus Rock, 788
 Evalouk Island, 1001
 Evans Arm, 622
 — Bay, 492
 Evdokef Islands, 666
 Evening Islet, 1025
 — Point, 536
 — Rock, 520
 Evratchey, Cape, 660
 Ewa, 1095
 Ewing Harbour, 283
 Expedition Bay, 767, 768
 Exposed Arm, 537
 — Bay, 525
 Eyi yama Point, 835
 Eyries, Mount, 1021

 Faepi, Point, 1044
 Faguin Islands, 934
 Fair Harbour, 458, 459
 — Haven, 1095
 Fairway Bank, 876
 — Rock, 525, 698
 Fairweather, Cape, and Mount, 625, 635
 Fais Island, 1004
 Fain Islets, 996, 999
 Falalep Island, 1004, 105
 Falalis Island, 1003
 Falau Islet, 995
 Falcon, Cape, and Rock, 295-6
 Falcone, 1047
 Falhao Islet, 999
 Falipi Island and Bank, 1000
 Faloupet Island, 979
 False Bay, 196
 False Alarms, Bay of, 683
 — Bay, 170, 210, 300
 — Capetan Head, 1161, 1152
 — Channel, 435
 — Cone Hill, 548
 — Creek, 466
 — Cardon Island, 57
 — Dungeness, 328
 — Egg Island, 516-17
 — Klamath River, 273
 — Mendocino, Cape, 208
 — Narrows, 287-8, 473
 — Point, 194, 622
 — Rock, 378, 379
 — Stuart Anchorage, 637

 False Tillamook Cape, 295
 False, Cape, 179
 —, Puerto, 210
 Faluelap or Falulap Islet, 1003
 Fanadik Island, 998
 Fanancou Islands, 996
 Fanning Island, 928-930
 Fanny Bay, 476, 477
 — Reef, 499
 Fanopé Island, 979
 Fanshaw, Cape, 608
 Faounoupei Island, 979
 Faraday Island, 675
 Faraguet Island, 1020
 Farailles Island, 1002
 Farallon de Medinilla, 1054-5
 — de Pajaros, 1059-1060
 — de Torres, 1055-6
 — Ingles, 10
 Farallones Alijos, 1107
 — Blancos, 173
 — Islands and Lighthouse, 267-9
 — Rocks, 58, 185
 Fararik Island, 1001
 Farewell, Cape, 535
 Farnham Island, 1035
 Farralone Point, 109
 Farrant Island, 544
 Farroilap Island, 1003
 Fatsizo Island, 842, 844-5
 Fattoilap Island, 1003
 Fauntleroy Cove, 337
 — Rock, 274
 Favaida Island, 484
 Favorite Channel, 615
 Favourite Anchorage, 628
 Fawn Islet, 363
 Fearless Rock, 287
 Feis or Feys Island, 1004
 Feklistoff Island, 748
 Felalisse Island, 1003
 Fellowes Passage, 770
 Fermin, Point, and Light-house, 212
 Fern Cove, 337
 Ferrer Point, 433
 Feruyé Harbour, 887
 Fidaigo Island, 343, 345
 — Port, 645
 Fiddle Reef, 402
 Fife, Cape, 581
 — Sound, 608
 Fiji Islands, 1266
 Philips, Point, 216
 Philippine Rock, 907
 Fimah Island, 1161
 Fin Island and Rock, 543
 Fin Rock, 284
 Final Point, 148
 Finder Rock, 225
 Fingal Island, 526
 Finisterre Mountains, 1018
 Finlayson Channel, 627, 530-32
 — Island, 554

 Finlayson, Mount, 371
 Fira sima, 1145
 Firando Island, 887
 — Port, 777, 887
 Firase Reef, 1145
 Fischel Island, 1019
 Fingard Island, 339
 — Island and Light-house, 305, 397
 Fish Bay, 627
 — River, 761
 — Rocks, 517
 Fisher Channel, 520-22
 — Island, 1128, 1135
 Fisherman Cove, 533, 535
 — Reef, 812
 — Rock, 793, 794
 Fishing Rocks, 263
 Fittin Bay, 1134
 Fitz Island, 433
 Fitzgibbon Point, 596
 Fitzhugh Sound, 518-520
 Fittsley Reef, 524
 Five-fathoms Shoal, 403
 Five-finger Island, 472
 Five Hills, Bay of, 198
 — Hummocks Point, 198, 199
 F'ka ura, 835, 836
 Flamenco Island, 13, 14
 Flat Bay, 752
 — Island, 790, 1156
 — Islands, 480, 484
 — Point, 359, 633
 — Rock, 108, 192, 572
 Flat-top Island, 357
 — Islands, 388, 468
 — Islets, 423
 — Point, 109
 — Mountains, 446, 447
 Flattery, Cape, and Light-house, 320, 324, 325-6
 — Rocks, 320
 Fleming, Port, 538
 Flora Creek, 285
 Florence Shoal, 1060
 Florentia Island, 419
 Flores Island, 423
 Florida Blanca, Braso de, 464
 Flower Islet, 435
 — Pot Islet, 577
 Flowery Islet, 680
 Fly Basin, 517
 Fog Rock, 407, 409, 411
 — Rocks, 522
 Foggy Cape, 595
 Folger Island, 1061
 Fonseca, Bay of, 66
 —, Gulf of, 57-64
 Fonte Bank, 352, 404
 Forsaulep Island, 1003-4
 Forbes Island, 417-18
 Forgade Rock, 1145
 Fortiyo Passage, 936
 Forest Cape, 636
 Forfana Island, 1138
 Formosa Island and Channel, 1260

- Forrester Island, 606
 Forsyth Point, 572
 Fort Lagoon, 195
 — Point, 563
 — Point and Lighthouse,
 242-3, 262
 — Yuma, 145
 Fortescue Island, 762
 Fortuna, Cape, 266, 268
 Fortune Channel, 422
 — Point, 564
 Forward Bay, 500-1
 — Inlet, 446, 447-8
 Forwood Channel, 469
 Foster Point, 363
 Foul Bay, 401
 — Point, 857
 Foulweather, Cape, 267,
 292
 — Bluff, 333,
 334
 Fountain Rock, 642
 Four Islands and Rocks,
 931, 932
 Four-fathoms Bank, 243,
 244, 251
 Four Mountains, Isles of
 the, 676
 Fourteen Island Group,
 968
 Fox, Cape, 560, 595
 — Island, 338, 339, 773
 — Islands, 669, 670-77
 Frailes Islets, Los, 18
 — Rocks, 109, 177
 Frangais, Port, 635
 Francis Island, 940
 — Point, 346, 486
 Francisco Solano Point,
 1254
 Frank Point, 564
 Franklin Bay, 1020
 — Point, 700
 Fraser Island, 986
 — Reach, 533
 — River, and Light-
 house, 454, 455, 458, 459-
 464, 493
 Frayles, Farallones de los,
 and Lighthouse, 267-9
 Fraser Island, 394
 Frederick Point, 492
 — Island, 586
 — Port, 621-2
 — Strait, 602
 Freeman Point, 761
 — Port, 774
 Freemantle Point, 645
 Freewill Islands, 1024
 Fréigates Françaises, Base
 des, 11. J
 French Frigates Shoal,
 1110-12
 Freshwater Bay, 142, 328,
 621
 — Island, 1032
 Friday Harbour, 366
 Friedrich Wilhelm Harbour,
 1019
 Friendly Cove, 428, 429-30,
 432
 Frigate Bay, 619
 Frigoli Point, 157
 Frie, River, 49
 Frits Cove, 612
 Frost Island, 360
 — Shoal, 1110
 Fruitful Island, 1035
 F'tago sima, 803
 Fuego, Volcan de, 3, 76, 77
 Fuerte, Rio del, 135
 Fukai, 895
 Fukai sima, 894-7
 Fukau Bay, 1148
 Fukuda saki, 899
 Fukugawa Bay, 880
 Fukuoka and Light, 883
 Fukura, 810
 Fukura saki, 876
 Fuku she, 890, 914
 Fuku sima, 886
 — Bay, 860
 Fuku ura, 815, 829
 — and Light, 791
 Fukuyama, 861
 Fukuyo Channel, 894
 Fulford Harbour, 374, 379
 — Reef, 403
 Funa-goshi Bay, 883
 Funa so, 880
 Fune Kata, 822
 Furibets, 871
 Furugolma Island, 767
 Fushiki, 875
 Fusi-yama Mountain, 779,
 781, 824, 832
 Fusa Peak, 737
 Futa sima, 909
 Futago sima, 896
 Futakami, 885
 Futako sima, 899
 Futo saki, 829
 Futsimotou Harbour and
 Light, 907
 Futsu saki, 832, 839
 Gabina River, 1018
 Gabriel Bay, 167
 Gabriela Island, Pass, and
 Reefs, 338, 468-9, 473
 Gagan Island, 565
 Gadamak Harbour, 773
 Galatca Shoal, 801
 Gale Creek, 628
 — Point, 646
 Galera, Cape, 217
 — Island, 9
 Galeras Islets, 163
 — Lodge, 170
 Galiano Island, 383, 508
 Gallego Island, 925
 Galley Rock, 417
 Gallina Island, 167
 Galito Point, 156
 Gallo Island, 167
 Gallows Point, 470
 Gama Satchi, 1153
 Gamaley, Cape, 865
 Gambia Shoal, 1117
 Gambier Island, 482, 483
 — Point, 610
 Gamble, Port, 340, 341
 Gami, Isla, 29
 Gamova, Cape, 767, 769
 Gana she, 890
 Gander Islands, 542
 Ganges Harbour, 379-380
 — Reef, 1126
 Gap Mountains, 446
 Gapen Island, 1045
 Garachine Point, 6
 Garapan, 1052-3
 Garbanzos Shoal, 1061
 Garden Cove, 705
 — Island, 644
 Gardner Channel, 534
 — City, 288
 — Harbour, 599
 — Island, 1004, 1112
 — Mount, 465
 — Point, 608, 613
 — Port, 342-3
 Garibaidi Peaks, 440
 Garna, Point, 607
 Garova Island, 58
 Garry Point, 461, 462
 Gas Town, 466
 Gaspar Island, 1034
 — Rock, 1108
 — Rico Islands, 861,
 1034-5
 Gastineaux Channel, 611
 Gaston Bay, 346
 Gattier Mountains, 1022
 Gavareah, Cape, 729, 730
 Gavelones Point, 162
 Geelvink Bay, 1022-4
 — Point, 1023
 Geloon Island, 1016
 Genkai Nada, 881
 — sima, 882
 Genn Islands, 538
 Gensiu gawa, 875
 Geoffrey, Mount, 476, 478
 George, Cape, 331, 557
 — Fort, 306
 — Hill, 554
 — Harbour, 574
 — Island, 624
 — Island and Bay,
 143
 — Point, 305, 523
 — Rock, 516, 615
 Georgia, Strait of, 322, 372,
 457-480
 Gerald Island, 475
 Gerasineov Island, 769
 Germantown Reef, 1149
 Ghibu-sai Rock, 832
 Ghibyga, 719, 745
 Ghibjask Gulf, 744-5
 — Fort, 745
 Gibraltar Island, 414
 Gibson Islands, 537
 Gigg Harbour, 337
 Giganta, Cerro de la, 159
 Gighiga, River, 744, 745

- Gihon Bluff, 272
 Gil Island and Mount, 534,
 543
 Gila River, 145
 Gilbert Archipelago, 935-
 949, 1200
 — Island, 946, 947
 — River, 775
 Gifford Island, 502
 Gillespie Island, 948
 Gillies Bay, 481, 484
 Gilmour, Point, 648
 Giquilisco, Port, 66
 Givry Island, 994, 995
 Glacier Bay, 622
 Gladstone, Mount, 1018
 Glasenapp Bay, 713, 714
 Glasenapp, Cape, 685
 Glenholme Creek, 381
 Glimpe Rocks, 400
 Gloubokaina Bay, 679
 — Cove, 675
 Gnarled Island, 599
 — Islands, 517, 560
 Gnaton, 1046
 Goat Cove, 631
 — Island, 959
 — Islands, 1134
 Goazacoonas River, 85
 Gobernador Island, 18
 Gogan Island, 962
 Gogonima, 796
Gold, 205, 454, 460, 569,
 587, 602, 611, 750, 773
 Gold Bluff, 272
 — Harbour, 587-8
 — River, 431
 Golden Gate, The, 207, 240-
 245
 — Horn Bay, 771
 — Rock, 812
 Goldmine Island and Light-
 house, 851
 Goldobin, Cape, and Lights,
 772
 Goldstream Harbour, 520
 Golenichtcheff, Cape, 725
 Goleta, La, 17
 Goletas Channel, 322, 507-
 510
 Golfo, The, 34
 Golovatcheff, Cape, 751,
 761, 765
 Golovnine Bay, 694-5
 Golownin Strait, 738
 Goly Island, 671
 Gomes Island, 125
 Gomiga saki, 869
 Go no ura, 883
 Gonzales Hill and Point,
 401
 — Island, 7, 9-10
 Gooch Island, 374
 Good Hope, Bay of, 865
 — Look-out Islands,
 1011
 — News, Bay of, 689
 Goose Island, 355, 623
 — Islands, 526
 Goose Lodge, 542
 — Spit, 478
 Gorbun Rock, 658
 Gorda, Piedra, 173
 — Point, 10, 23, 31,
 41-2, 172, 174, 176, 230,
 266
 Gorder Head, 366
 — Islands, 508
 — Point, 502, 504, 554
 — River, 393
 Gore Island, 145
 — Island and Cape, 703,
 704
 — Point, 649
 Goreli Island, 677
 Goreloy Island, 681
 George Harbour, 490
 Gorgon Rock, 53
 Goschen Island, 557
 Gosling Rocks, 526
 Gotenman Peak, 802
 Goten yama, 838
 Goto, Cape, and Light-
 house, 896
 — Islands, 891-7
 Goulding Harbour, 626
 Goulou Islands, 1007
 Govensko, Cape, 720
 Governor Rock, 384
 Grower Point, 481
 Gowlland Harbour and
 Island, 495
 — Rocks, 419
 Go-yo-mai Strait, 866
 Goza Harbour, 819
 Gosen iwa, 823
 Grace, Point, 647
 Graham Bluff, 836
 — Cape, 107
 — Harbour, 650-1
 — Island, 571, 679,
 586
 — Reach, 532-3
 Gragero Point, 201
 Grampus Islands, 1127
 Granada and Lake, 49, 50
 Granada River, 35
 Grand Canon, The, 145
 Grande, Rio, 14, 31, 70,
 265
 Granite Cove, 624
 — Island, 148, 441
 — Point, 496, 573, 574
 Grantley Harbour, 696-7
 Grappler Creek, 407
 — Reef, 378
 Grassy Islet, 528
 — Point, 478
 Grave Point, 523
 Graven, Point, 628
 Graves, Port, 482, 483
 Gravina Islands, 598, 699
 — Port, 645
 Gray Bay, 578
 — Harbour, 315-17
 — Point and Bay, 305
 — Feather Bank, 997
 Great Bank, 416
 Great Lu-chu Island, 1150-
 1155
 Gross Bank, 364
 — Cove, 409-10, 419
 — Head, 442
 — Hill, 294
 — Inlet, 533
 — Islands, 622, 647,
 648, 1122
 — Islet, 560
 — Islets, 557
 — Point, 329, 369
 — Top Islet, 646, 650
 Greenwich Island, 988-9
 Gregory, Cape, and Light-
 house, 267, 285-6
 Greig, Cape, 686-7, 855
 Grenville, Cape, 295
 — Channel, 634,
 635-7, 545
 — Point, 318
 Greville, Cape, 656, 659
 Grey Islands, 519
 — Islet, 560
 — Point, 464, 465
 — Rock, 474, 510
 Grubbell Island, 533
 Grief Bay, 518, 524
 — Point, 498
 Griffin Bay, 356
 — Mount, 553, 555
 Grifo Island and Point,
 849
 Grigan Island, 1038, 1038
 Grimes Island, 1004
 Grindall, Point, and Island,
 600
 Grossvitcha Bay, 761
 Grottes, Pointe des, 1054
 Grucma Point, 131
 Guacolate River, 79
 Guadalupe, 115
 Guadalupe, Baya de, 629
 Guadalupe, 155
 — Island, 1107-
 1108
 Graham Island, 1037, 1038,
 1041
 Guanjan Island, 1039, 1041
 Guam Island, 1041-7
 Guannacaste, 31
 Guanavato, 20, 30
Guano, 926, 933, 935, 1033
 Guano Rock, 286
 Guap Island, 1005
 Guapilon Point, 36
 Guaymas Arm, 431
 Guaymas Point, 21, 22
 Guatemala, Coast of, 1, 2,
 3, 6, 75, 1172
 — Volcanos, 69,
 77
 Guatulo, Port, 93-5
 Guaymas River, 227
 Guayquil, 1255
 Guaymas, 83, 85, 130, 131,
 137-140, 169
 Guaymas Island, 58, 59
 Guay-gichi, Punta de, 88

land, 1150.

64
9-10, 419
2

622, 647,

7

9, 369

5, 646, 550

3, 988-9

and Light-

6-8

7, 853

295

nel, 634,

318

56, 659

9

465

510

633

24

53, 555

nd Point,

38, 1058

04

nd Island,

761

se, 1054

79

le, 629

1107-

37, 1038,

1, 1041

-7

35, 1033

22

4, 1, 2,

5, 69,

7

0, 131,

5, 59

8, 53

Guemes Island, 316
Guérin Gulf, 769
Guérin, Mount, 981, 983
Guerrero, 81
Guguan Island, 1055, 1056-7
Guide Islets, 490
Guizarros, Punta de las, 209
Guionas, Cape, 40, 41
Guirana, Punta de, 209
Gulf Rock, 763
Gull Rock, 158, 573
— Rocks, 560, 558
Guminski, 909
Gun Cliff, 856
Gunboat Harbour, 537
— Passage, 524
Gunn Rock, 894
Gunner Harbour, 423
Gurguan, Point, 1051
Gurneyville, 262
Guy Rock, 1059

Habana Island, 164
Habushi-iwa, 800
Hachi gauno, 799
Hachijo, 844
Hachimann saki, 848
Hachken gawa, 811
Hacq Island, 994, 995
Hada-xase Rock, 901
Hadaka sima, 810
Haddington Island, 505
— Port, 1157.

1159-1160
Hadiki saki, 873
Hadshi Bay, 761-2
Haena Harbour, 1103
Hagemeister Island, 638
Hagemir Islands, 766
Hahainish Harbour, 342
Haide Point, 363
Haidomari Bay, 893
Hakai Channel, 520, 524-5
Haka se, 820
Hakata and Light, 863
Hakata sima, 799
Haki Bay, 880
Hakodate Harbour and Lt.-
vessel, 827, 858-860, 779,
780, 781, 1263, 1264
— Head, 858
Hakosaki Bay, 881-3
Hako sima, 890
Halawa Point, 1092
Haleyon Island, 1036
Haleloa Bay, 1102
Halenof, Cape, 765
Half-moon Bay, 236-7
Half-tide Rock, 356, 360,
421, 425
Halgan, Cape, 717
Halibut Bank, 675
— Bay, 666
— Channel, 437, 440-1
— Island & Head, 668
— Rock, 621
— Rocks, 548

Hall Island, 703, 704, 946
— Islands, 995-6

Hallowes Island, 897
Halls Breakers, 1155
Hamagoma ura, 819
Hamaichi, 786
Hamaoka Bay, 863, 865-6
Hamana Ke, 822
Hama-maten, 822
Hamolin Strait, 770
Hamilton Point, 1159, 1160
Hammeraley Inlet, 339
Hammond Rock, 559
— Rocks, 393

Hamo, 872
— Bank, 791, 794
Hamood, Cape, 641
Hana Bay, 866
Hanadi Islet, 1155
Hanaguri sima, 898
Hanalei Bay, 1102-3
Hanamanou, Cape, 1086
Hanam ura, 802
Hanapepe Valley, 1101
Hana-roto, 835
Hana so, 895
Hancock Bay, 1148
— Point and Light-
house, 301
Hand Island, 417
Haneda Point and Light-
house, 838
Hangata, 798
Hangi Bay, 880
Hankin Point, 363
— Point and Lodge,
547
— Reefs, 555
— Rock, 422

Hankow Breakers, 1019
Hanner Rocks, 558
Hanna Rock, 515
Hanning Bay, 647
Hans Olason Island, 864
Hanson Island, 501
— Point, 315
Hanus Island, 630
— Reef, 614, 621
Harbledown Island, 501
Harbour Bank, 547
— Island, 409-410,
435, 523, 1147
— Island and Lodge,
525
— Point, 107
— Reefs, 555
— Rock, 363, 535

Hardwicke Island, 499
Hardy Bay, 507
— Island, 487
— Harbour, 894
Harford, 228
Hargassoff Point, 743
Harima Nada, 788, 801-5
Harlech Castle Rock, 230
Harney Channel, 363
Haro Archipelago, 322, 351
— 364
— Cape, 138, 140
— Strait, 351, 364-388,
457

Harriet Harbour & Island,
574

— Point, 653
Harrington, Point, 603
Harris Point, 227, 607
Harrisburg, 611
Harrison River, 455, 461
Hartford, Port, 228
Harvey, Port, 500
Harwood Island, 485, 487-8
Hashi hama Inlet, 797
Hachima saki, 909
Hashmy Islands, 993
Haskiwi, 815
Ha sima, 835
Hasingus, 815
Hasiri sima, 800
Haster Cove, 200
— Rock, 275
Hastings Arm, 555
Hayokan Island, 1158,
1162

Hat Island, 443
Hataka sima, 1148
Hatoma sima, 1158
Hato saki, 884
Hatau sima, 829
Haula Bay, 1093
Haumilulu, 90
Hautboy Islet, 345
Havannah Channel, 500
— Rock, 36
Havlock Rock, 550
Haven Anchorage, 263
Havock Islands, 785
Hawaii, 1063, 1065, 1067,
1068, 1071-1085
— Cape, 701
Hawian Archipelago, 1062
— 1106
Hawes Islands, 1000
Hawkesbury Island, 533
Hawkins Island, 381, 644
Haya saki Channel, 907
Haycock Bluff, 836
— Island and Rocks,
545

— Islet, 553
— Islets, 513
— Rock, 913
Hayes Pass, 969
— Point, 628
Haystack Islet and Point,
293
— Rock, 267, 847

Haystacks Rocks, 442
Haystrous Island, 1034
Huzama Hill, 831
Hazel Point, 341
Hazen Bay, 690
Hazy Islands, 612
Hazama, 819
Head Eay, 431
Healaka Point, 1077
Healdsburg, 262
Heber Reef, 1155
Hebi sima, 1145
Hecate Channel, 435, 526
— Cove, 449-450, 451

- Heaceta Island, 520, 524
 — Passage and Bay,
 403, 412, 421, 425
 — Rock, 512, 552
 — Strait, 568
 Heaceta Bank and Cape, 289
 — 290
 — Inlet, 278
 Heda Bay, 823, 825
 Hedley Patch, 518
 Heeia, 1094
 Heiden, Mount, 720
 Helby Island, 408, 412
 Hele Rock, 1154
 Helen Point, 368, 381
 — Reef, 1025-6
 — Mar Shoal, 700
 Helene Reef, 999
 Helhaghy Bay, 711
 Helmecken Island, 499
 Helmet Islet, 577
 — Peak, 527
 Helsinki Island, 1036
 Helut Islands, 966
 Hemming Bay, 647
 Henderson Inlet, 339
 — Island, 1108
 Hendersonville Island, 936, 944,
 945
 Henry Bay, 476, 477
 — Cape, 586, 588
 — Island, 366, 371,
 557
 Henslow, Cape, 1031
 Henslung Cove, 585
 Henty Reef, 1145
 Hepburn Point, 636
 Herald Island and Shoal,
 701
 Herbert Arm, 425
 — Island, 1154
 — Point, 524
 — Reefs, 538
 Hermanos Islets, 121
 Hermits Islands, 1016-17
 Hermosa Point and Bay, 19
 Hermosillo, 130, 137, 140
 Hormoso, Morro, 41, 190
 Hernandez Island, 488
 Herradura, Port, and Point,
 36, 37
 Herros Islet, 25
 He saki, 786
 — sima, 820
 Hesper Island, 1149
 Hespulat Harbour and Bluff,
 425-6
 Heto, Cape, 1154
 Hewitt Rock, 532
 Hewlett Bay, 588
 Hey, Point, 642
 — sima, 787
 Hibara-sima, 827
 Hicaria Islet, 20
 Hicaron Island, 20
 Hidaka kawa, 813
 Hido Bay, 1073
 Hie Kish Narrows, 532
 Hielp Island, 1065
 Hi-ellen River, 582
 Hi gawa, 804
 Higgins, Point, 597
 High Bluff, 174
 High Island, 956, 1004
 High Leaning Peak, 196
 Highest Islands, 437
 Highfield, Point, 601
 High-water Rock, 363
 — Rocks, 536, 548
 Higiri saki, 801
 Higo, 907
 Hiketa Point, 803
 Hiki gawa, 814
 — sima, 800, 890
 Hiku Flat, 791, 794
 — sima and Light, 789,
 791
 Hildebrandt Islet, 769
 Hill Island, 408, 412, 492,
 626, 883
 Hill Point, 762
 — Rock, 10
 Hillsborough Island, 1135
 Hilo, Bay, and Lights,
 1073-7
 Himo sima, 795, 883, 897
 — Reef, 877
 Hinchinbrook Island and
 Cape, 641, 643-4
 Hindmost River, 616
 Hino misaki and yama, 813
 — yama, 793
 Hingo and Light, 779, 807,
 837
 Hiotan jima, 799
 Hoppa Island, 586
 Horado, 887
 Horado no seto, 887, 888-9,
 914
 — sima, 887-8, 913
 Hira iwa, 805
 Hirakubo saki, 1158
 Hirase Rocks, 884, 899,
 906, 909
 Hira sima, 851, 883, 893
 Hirose Rocks, 796, 888
 Hiro sima, 796, 800
 Hirowatchi Bay, 812
 Hissaka no minato, 894
 — sima, 894
 Hishiwo Bank, 903
 Hi sima, 900
 Hitrova, Cape, 721
 Hiuou, Cape, 579
 Hi-uchi Nada, 799-800
 Hi ura, 810
 Hivo Rock, 817
 Hiyou yama and Light-
 house, 870
 Hiroyiye Bay, 796
 Ho-age Rock, 889, 892
 Hon-pin-au Island, 1162
 Hobart, Point, 510
 Hobbs Islet, 420
 Hodge Rock, 892
 Hodgson Reefs, 552
 Hogra Island, 626
 Hogoken Islands, 993-5
 Ho-hone Island, 439
 Hoidji, Cape, 760
 Holdsworth, Mount, 564
 Hole in the Wall, 426
 Holkham Bay, 610
 Holland Island, 934
 — Islet, 650
 — Point, 400
 Holmes Bay, 534, 544
 — Harbour, 343
 Holy Cross Bay, 718-719
 Homelike or Homathiko
 River, 493, 494
 Home Island, 483
 Homfray Channel, 490
 Homuku Point, 536
 Honda, Bahia, 21-2
 Honduras, 1, 3, 5
 Hong Kong, 1266, &c.
 Hon-na-mi, 853
 Honolulu, Harbour, and
 Lights, 1067, 1095-9,
 1241
 Honoonoono, 1095
 Honotau, 875
 Honahu, 778
 Hooch River, 320
 Hood Bay, 613
 — Canal and Head, 333,
 340-42
 — Mount, 310
 — Point, 482, 609
 Hoonyah Harbour, 621-2
 Hoop Reef, 515
 Hope, 460
 — Island, 509, 939
 — Point, 483, 609
 Hopper Island, 936, 945
 Hoquiamts River, 317
 Horino-utsi-mura, 830
 Horn, Cape, 1235
 Hornby Island, 473, 475-6,
 478
 — Point, 572
 Horn r, Cape, 750
 — Mount, 783
 Hornet Bay, 773
 — Islands, 916
 Horonai, 868
 Horse-shoe Bay, 376, 377
 Hosika saki, 885, 888
 Hoskyn Islet, 491
 Hoso sima, 799
 — Harbour, 786
 Hotham Islet, 695
 Hot Spring Island, 575
 Houdoten Bay, 588
 Houghton, Port, 609-610
 Hounkdgaa Bay, 1047
 House Island, 575
 Houston Island, 360
 — Passage, 378, 384
 — Stewart Channel,
 571, 572-3, 588
 Howe, Point, 602
 — Sound, 466, 481-3
 Howkan Strait, 566
 Howland Island, 934-5
 Hoza ura, 819
 Huazatlan Hills, 87
 Hudson Island, 378
 — Point, 332

Huene Point, and Light-house, 216
 — Port, 216
 Hugh, Point, 610
 Hugen, Cape, 767
 Hulah Rocks, 352
 Hulala Harbour, 1109
 Huloia River, 1101
 Hull Island, 500
 Humboldt Bay, 1021
 Humboldt Bay and Light-house, 268-270
 — Port, 270
 — Harbour, 667
 Hummock Island, 1160
 Hup Island, 1023
 Humpback Rock, 657
 Humtolapy River, 317
 Hungry Rock, 901
 Hunt, Point, 550
 Hunter Cove and Islet, 281
 Hunter Island, 525, 526, 967
 — Point, 240
 — Reef, 1007
 Hard Island, 939
 Hurst Island, 510
 Hurtado Point, 488
 Huso sima, 799
 Huston Inlet, 574
 Hutchinson Reef, 657
 Huxley Island, 575
 Hyacinthe Bay, 491
 Hyaku Kuan, 799
 Iaitchoi, Cape, 679
 Ianthe Shoal, 1001
 Ibarquitta Island, 999
 Ibbotson, Cape, 657
 — Islands, 957
 Ibasso, 873
 Ibo Point, 878
 Ibuki sima, 800
 Icacos Point, 53
 Ice, 700-1, 1229-1230
 Ice Harbour, 762
 Iceberg Bay, 663
 — Point, 623
 Icey Island, 1155
 Ichi-no-hana yama, 805
 Icy Bay and Cape, 638-9
 — Cape, 635, 700
 — Sea, 700-2
 — Strait, 624
 Idol Islet, 378
 Idraque River, 35
 Idau, Cape, and Light-house, 825-6, 832, 839
 Idau Peninsula, 823, 825
 Idau Islands, 884
 Idau Islands, 1001
 Igama Bay, 880
 Igataky Bay, 659
 Igakchi Bay, 659
 Iglesia, Point, 111
 Igna-look Island, 698
 Igognak Point, 673
 Iguaa Island, 17
 — Point, 10
 Ihak Bay, 659

Ihatok Peninsula, 668
 Ikatun Peninsula, 668
 Iko sima, 890
 Iki sima, 883-4
 Ikop Island, 909
 Ikutaki Island and Channel, 886
 Iddefonso Island, 158
 Ikenao, 14
 Ilisminsk Peak, 653
 Ilibe saki, 813
 Illic Bay, 1045, 1047
 Ilak Island, 681
 Iluluk Harbour, 672, 673, 1181
 Ipinakol, Cape, 720, 726
 Imabari, 798
 Imagawa, Cape, 795
 Imago Point, 679, 580
 Ima-haru Bay, 916
 Imari Gulf, 885-6
 Imita no seto, 911
 Imizu gawa, 875
 Imperial, Port, and River, 761, 762
 Imperieuse Bluff, 830
 Inabusha Reef, 1151
 Inago, Mount, 1043
 Indian Island, 270, 423, 509, 531
 — Cove, 515
 — Point, 363
 Indio, River, 12
 Industrie Rock, 49
 Ine, Port, 878-9
 Inferior Lagoon, 86
 Infernello Channel, 141
 Inferno, Boca del, 430
 Ingakadak Bay, 675
 Ingersoll Patches, 1151-2
 — Rocks, 1144
 Ingostern Rocks, 683
 Inghe sima, 803
 Inglesfield Island, 1158
 Inglose, Morro, 136, 137
 Inland Sea, The, 779, 788-815
 Inner Islands, 676
 In-no sima, 799
 Inokushi Harbour, 786
 Ino ura, 801
 Inskip Channel, 587
 — Passage, 655
 Insolita Island, 24
 Insu Island, 862
 Intrase Islet, 25
 Inu-bo-ye saki and Light-house, 849
 Inverness Slough, 539
 Invincible Point, 146
 Invisible Point, 682
 Ioji hama no hana Point, 803
 Ioro sima, 1148
 Irakong Island, 1011
 Irako saki, 821
 Ir-Kaipie, Cape, 708
 Iron Point, 573
 — Rocks, 515

Irons Shoal, 999
 Ironsides Island, 619
 Iro-o saki and Lighthouse, 825-6
 Isabel Island, 120, 123
 — Mount, 183
 — Port, 144
 Isabella Point, 379
 — Reef, 999
 I saki and Lighthouse, 792
 Isaki Reef, 813
 Isalco Volcano, 3, 73-4
 Isanotaky Strait, 665, 668
 Isa saki, 787
 Isena sima, 1156
 Isibama, 850
 Ishigaki Harbour, 1160
 — Iwa, 821
 — sima, 1158
 Ishimo saki, 815
 Ishinomaki, 850
 I sima, 787, 811
 Isei Sea, 822
 Iskari Bay, 868, 870-1
 Isla Grande Bay, 102
 Island Bay, 574
 — Cove, 423, 431
 — Harbour, 413, 414
 Islands, Bay of, 619, 626, 680
 Islet Point, 773
 Islets Islands, 33
 — Islets, 167
 Ismonai Bay and Rock, 730, 732-3
 Isono sima, 877
 Isonosu Hill, 876
 Issannakh Mountains, 670
 — Strait, 665, 668
 Istapa, 31, 74, 75-77, 1240, 1251
 — Bay and Mount, 102-3
 Isthmus Cove, 221
 Istmo, Isles del, 7
 Isumi Nada, 779, 788, 805-8
 — Strait, 804, 808-9
 Isuno saki, 815
 Itabe sima, 895
 Itmen Bay, 741
 Itobasco, 67
 Itopango Lake, 68
 Itsha, River, 743
 Itahinsk, 743
 Itsino sima, 815
 Itaiye misaki, 813
 Ituhara Bay, 916
 Itau Bay, 803
 Itygran Island, 711, 713-4
 Iturup Island, 736, 740-1
 Ivory Island, 528
 Iwami sima, 795
 Iwani, 863, 870
 Iwashima, 799
 Iwa-wada Point, 817, 849, 854
 Iwaya, 805
 — Point, 790
 Iwoga sima, 783, 1143

Two sime, 1149
 Two sime and Lighthouse, 999, 995
 Iwoss Rock, 889
 Iye Island, 1153-4
 Iyo, Cape, 796, 797
 — Nade, 788, 796
 Isenbek, 685
 Istapam, 75
 Jabali, Cape, 31
 Jabor Island, 967
 Jabwat Island, 963, 966
 Jackson Bay, 499
 — Passage, 531
 — Point, 696
 Jacobi Island, 619, 624
 Jalisco, 81, 130
 Jaltemba Bay, 112
 Jaluit Islands, 962, 966-7
 Jal-un River, 585
 James Bay, 381
 — Cape, 509
 — Island, 352, 372
 — Point, 375, 536
 — Rock, 517, 888
 Jamestown Bay, 534
 Jane Creek, 523
 — Island, 531, 989, 1034
 Japanese Archipelago, The, 777-917, 1184-90, 1257, 1260, 1266, &c.
 — Strait, 770
 Japan, Sea of, 915-16, 1189, 1213
 Japonaki Island, 631
 Jappen Island, 1023
 Jardines Islands, 1037, 1126
 Jarvis Island, 926
 Jeannette Island, 846
 Jecoits Harbour, 985
 Jefferson, Point, 334
 Jelti, Cape, 736
 Jekoits Island, 992, 985
 Jeltukhin Island, 779
 Jemo Island, 982, 969
 Jemmy Jones Islet, 103-4
 Jenkins Island, 484
 Jennie Point, 359
 Jequepa Point, 102
 Jerabot Island, 1145
 Jeridy Island, 955
 Jarvis Inlet, 485-7
 Jesso Island, 862
 Jenu yama, 820
 Jiboa River, 68
 Jijiginsk, Port, 745
 Jiquilaco, Port, 66-7
 Jishe Kashe Reef, 1151
 Jitkoff, 771
 Joachim Island, 519
 Joann Bogosloff Island, 675-6
 Joaquin River, 249
 Jobi Island, 1022, 1023
 Jogo Bay, 878
 John Begg Rock, 223
 John Reef, 561

John River, 317
 — Port, 522
 Johns Island, 369
 Johnson Channel, 522
 Johnston Islands, 1033-4
 — Rock, 811
 Johnstone Reef, 366
 — Strait, 322, 497, 498-501
 Joka sime and Lighthouse, 831
 Jonas Island, 747
 Jones Island, 357, 373
 — Point, 616
 Jonquiere Bay, 750, 757, 760-1
 Joqueits Island, 986
 Jordan, River, 393
 Jorkins Point, 527, 530
 Jostling Peninsula, 588
 Joupnoff Volcano, 728
 Juan de Fuca Strait, 321-331, 390, 392-404, 1175
 Juan Peres Sound, 575-6
 — Rodriguez Island, 224, 226
 Juanilla Island, 43
 Juchitan River, 86
 Judas, Cape, 181
 — Mount, 31
 — Point, 36
 Judd Rock, 517
 Julia Island, 383
 Julie Island, 1143
 Julo Island, 1150
 Junction Passage, 413, 415
 — Point, 489
 Juneeu, 611
 Junk Cove, 846
 — River, 1151
 Jurij Island, 968

Kaalaea, 1094
 Kaavoloo Cove, 1082
 Kaawa, 1094
 Kabahala Island, 963
 Kaba sime & Bay, 903, 906
 Kabé sime, 884
 Kabuto yama, 880
 — saki, 901
 Kaboi Island, 1023
 Kada Bay, 818
 Kadiak Archipelago, 655-60
 — Rock, 657
 Kadji Island, 799
 Kadjitori saki, 797
 Kadoolawe Island, 1090
 Kado sime and Lighthouse, 789, 880
 Kadota-yama Head, 875
 Kadeusa, 832
 — Bay, 841
 — saki, 834
 Kadsura sime, 819, 893
 Kaegsialk, 702
 Kaena Point, 1093, 8094
 Kagai Island, 666
 Kagamil Island, 670
 Kagamiye gawa, 821

Kagura sime, 884
 Kaguro sime and Light-house, 901
 Kaguro sime, 1148
 Kagosime and Light, 785
 — Gulf, and Light, 784-5
 Kagura sime, 898
 Kahiki, Cape, 1086
 Kah-la-wat-set River, 289
 Kahoolawe Island, 1090
 Kah-tse-illa Rapids, 511
 Kahului Island, 1063, 1090
 Kahului Harbour, 1087
 Kawaii Island, 1023
 Kaioie Waho Channel, 1100
 Kaigashnee Strait, 606
 Kailua Bay, 1080-1
 Kairua Bay, 1063, 1080-1
 Kaiwi Channel, 1092
 Kajangle Islet, 1011
 Kai-kake, 887
 Kakaia Bay, 1093
 Kakeuka minato, 822
 Kakhvalga Island, 681
 Kaki no ura sime, 890
 Kakiromma sime, 1146, 1149
 Kaki-saki, 827
 Ka-Klees-la, Cape, 514
 Kakuu River, 652
 Kakooa, 1082
 Ka Lee Point, 1085
 Kalakhtyrka, River, 729
 Kalama, 399
 Kalanoa, 1091
 Kalauao, 1092
 Kalavala Bay, 768
 Kalgheita Bay, 672, 673
 Kalokhta, Cape, 674
 Kaluaaba, 1091
 Kama Islands, 1003
 Kamada Harbour, 888
 Kama-i-shi Harbour, 851-2
 Kamakura, 836
 Kamalaea Bay, 1089
 Kamami, 863
 Ka-mas-ik, 527
 Kamchatka Peninsula, 724
 — 736, 743-4, 1182
 Kamchatka River and Cape, 726, 727
 — Sea of, 661
 Kamchatakol, Cape, and Volcano, 727
 Kamennaya Pristan, 695
 Kamennoi Bay, 694
 Kamen Opasnost Rock, 764, 785
 Kame ura, 908
 Kamida Creek, 859
 Kaminoi, 744
 Kami no Koshiki, 911-2
 Kaminone sime, 1146
 Kaminosaki, 796
 Kaminosima, 901
 Kaminose Rocks, 784, 785, 816
 Kami sime, 824
 Kaminone Rocks, 897
 Kamita hana, 911

881
and Light.
1148
Light, 785
and Light,
998
1086
River, 289
and, 1090
Islands, 511
and, 1065, 1090
our, 1087
1023
Channel, 1100
at, 606
80-1
63, 1080-1
1092
1011
993
to, 822
and, 681
us, 890
1146, 1149
pe, 514
52
1085
iver, 729
58
72, 673
672
003
r, 888
our, 851-2
089
ma, 724
182
and Cape,
f, 661
po, and
695
Rock
1-2
3
85, 816

Kamoda saki, 811
Kamoiets, Cape, 871
Kamono sima, 868
Kan Islets, 627
Kanabuse, 793, 794
Kanaga Island, 681
Kanagahira Rock, 889
Kanaawa, 779, 837
Kanal saki, 886
Kanakiki, 1073
Kansawa Inlet, 836
Kanatoo Rock, 885
Kanawa Rock, 844
Kanaya Point, 832, 841
Kameda Bay, 833, 841
Kanege saki, 790, 881
Kanehe, 1094
Kancote, 1093
Kanghynin Bay, 718
Kanon saki, 786
Kanon saki and Ia-ho, 834
Kansu Island, 792
Kansu River, 293
Kapeosar Island, 987
Kapeosar Island, 989
Kapeosar Island, 987
Kapi-liah, 519
Kapinga Malany Is., 988
Kapiho Point, 1073
Karafuta, 748
Karafuto guchi, 1151
Karafuto, 748
Karaga, River, 726
Karaghinaka Bay, 726
Karaghinaky Island, 725-6
Karakakoo and Bay, 1081,
1082-4
Karamo sima, 812
Karanzin Island, 770
Karasu Island, 785
Karatau-no ura, 883
Kareki Islets, 888
Kariya Harbour, 885
Karouk, 659
Karquines Strait, 248-9
Karakov Bay, 759
Karsakovsk, 754
Kasano yama, 813
Kasano she, 784-5
Kasato Island, 796
Kashé Rock, 890
Kaishi no ura, 894-5
Kasira sima, 883
Kasawa, 801
Kasatotschy Island, 680
Kasu sima, 908
Kata, 809
— Island, 998
— sima, 833, 884, 890
— ura, 909
Katalamet Point, 308
Katelma Island, 987
Kator Island, 1128, 1130
Katona sima, 1148
Katahiriki Point, 835
Kato ura, 817
Katsuri saki, 881
Katsur, 848-9
Kattou Island, 1012

Kau, 1084
Kauai Island, 1065, 1067,
1068, 1071, 1099-1103
Kauai Head, 1086
Kaula Island, 1064, 1106
Kaulaka Passage, 1103
Kaulano Point, 1080
Kaunakakai, 1091
Kauriko yama, 875
Kavassk Passage, 1014
Kaven Islands, 957
Kaviyak Bay, 696
Kawa guchi, 806
Kawahao Bay and Light,
1078-1080
Kawailoa Bay, 1093, 1094
Kawajiri, 850
Kawara yama, 905
Kawa saki and Lighthouse,
838
Kawasiri yama, 870
Kawatchi Bay, 887
Kawen Islands, 957
Kayak Island, 641
Kayak Islet, 631
Ka yama Rock, 834, 840
Kaye Island, 641
Kayeta saki, 786
Ka-y-ne Island, 713
Kazakavitch Island, 770
Kedakakahi, Cape, and
Channel, 1090
Kealakekua and Bay, 1081,
1082-4
Keary Rock, 894
Keate Bank, 954-5
— Island, 482, 483
Keel Point, 1082
Kei Islands, 1150
— River, 1022
Kellett Bluff, 365, 371
— Channel, 192
— Island and Ledge,
352
Kelly Island, 1136
Kelp Bar, 477
— Bay, 407, 411-12
— Islet, 418
— Patch, 532
— Point, 191, 518, 525
— Reefs, 365
— Rock, 551
Kelsmart, 420
Kemano Bay, 534
Kenai, Fort, 693
Kenaanow Island, 613
Kenay Bay, 1179
— Peninsula, 650
Kendrick Arm, 430
— Island, 1140
Kennedy Island, 537-8, 540,
587
Keppel, Cape, 375
Kerama Islands and Chan-
nel, 1155-8
Kera sima, 1155
Kerouart Islets, 571
Ketoy Island, 739
Keya saki, 883

Khadatka, Cape, 738
Khalpith, Cape, 744
Khalutskin, Cape, 711
Kharimukotan Island, 738
Kharimukotan Island, 738
Khalap Island, 1095
Khithkouk, Cape, 670, 671
Khithroff, Cape, 721
Khrantschenko Bay, 688
Khatso Inlet, 533
Khatseymateen Inlet, 562
Kibatsu Bay, 902
Kibune Point, 791
Kibuta Rock, 893
Kidi Island, 1128, 1135
Kigalga Island, 671
Kigalgin Island, 676
Kigatou, 887
Kin Channel, 787, 789, 809
— 811-15, 832, 1185
Kikai-ga sima, 1149
Kiku Islands and Strait,
907
Kilauoa Volcano, 1069,
1072
Kilawalaka, 564
Kili Island, 962, 967-8
Kilbait Harbour, 332
Kilhamuck Bay and River,
295
Kililiak Bay, 674
Kiloudensky Bay, 659
Kiludon Bay, 659
Kimball Islands, 1049
Kincolith, 563
King, Cape, 720, 847, 848
— Island, 408, 521, 695
— George's Sound, 427
— George III. Archipe-
lago, 594, 607, 618
— Salmon River, 617
— William, Cape, 1018
Kingoombé Inlet, 502
— Point, 533
Kingfisher Cove, 674
Kinghorn Island, 489
Kingkasan Island & Light-
house, 851, 1264
Kingsmill Islands, 936
— Point, 607
Kingman Reef, 932
Kin-gui Island, 578
Kinnahan Islands, 550
Kino Point and Bay, 141
Kinposan Hill, 909
Kiori, Cape, 853
Kioto, 807, 838
Kiraoah Volcano, 1072
Kirikiri, 832
Kirilovskaya Bay, 682
Kiro yama, 813
Kiritappu sima, 865, 866
Kishu gawa, 805-6
Kisi, 765
Kisiku no minato, 897
Kiaka Island, 669, 682-3
Kitagotigh Island, 667
Kita Kami River & Light,
850

- Kitenamagan Island, 668
 Kithouk, Cape, 670
 Kiti Harbour, 983-4
 Kit-i-mat Arm, 534
 Kititsu Hill, 541
 Kit-kia-tah, 535
 Kitlup River, 534
 Kitousi Hill, 760
 Kitagatala, 539
 Kit-Sah-Wall, 564
 Kitano no se, 835
 Kitson Islet, 550
 Kitau Point, 848
 ——— ura, 848
 Kittitz, Point, 981
 Kitty Patch, 530
 Kiumoruan, 864
 Kiuntutanany Island, 666
 Kiusu Island, 778, 783-7,
 881—891, 898—910
 Kiwaah Island, 520
 Klahohok Rock, 327
 Klamath River, 272-3
 Klamet River, 281
 Klappoth Point, 768
 Klaskino Inlet and Rocks,
 443, 444-5
 Klaskish Inlet, 443, 444
 Klas-Kwon Point, 584
 Klekane Arm, 533
 Klemtoo Passage, 532
 Klewugigit Inlet, 535-7
 Kliavakhan, 606
 Kliche-tso-ati Harbour, 523
 Klikeff Point, 764
 Klikova Rock, 768
 Kluhevsk Peak, 728
 Kluhevskai Volcano, 727
 Klokachova Sound and
 Island, 619, 626-8
 Klokatcheff, Cape, 751
 Klokatch Rock, 283
 Kloster-camp Point and
 Lighthouse, 763
 Klus, 577
 Kluseny River, 617
 Klukquan, 617
 Klen-Kwoi Bay, 576
 Klutchevskoi Volcano, 678,
 725, 727
 Klutchi, 727
 Klykoff Point, 754
 Knapp Island, 373
 Knight Inlet, 561
 ——— Island, 637, 647
 Knocker Rock, 15
 Knorr Island, 1131
 Knox Bay, 498
 ——— Cape, 585
 ——— Island, 947
 ——— Islands, 954
 ——— Point, 555
 Knoy Island, 936, 947
 Ko-ajiro Bay, 830-1
 Koonsoff Island, 748
 Koa ura, 819
 Ko Anika sima, 887
 Kobé and Lights, 779, 807,
 877
 Kodiak Archipelago, 590,
 591, 593, 655-660, 1179,
 1180, 1211
 Kodo-kopuei Island, 1027
 Kodono sima, 798
 Koduchi sima, 801
 Kodzino Island, 846
 Ko Futakami, 885
 Ko-guro sima, 892
 Kogushi Fort, 804
 Kohala, 1078
 Kohama, 849
 Kohobi sima, 1145
 Koikla Point, 326
 Ko Iso mura, 802
 ——— Point, 802
 Koitlah Point, 326
 Kojima Island, 897
 ——— Islet, 893
 Koko sima, 789
 Kok-shittle Arm, 439-440
 Kokskar Rock, 737
 Kokura and Ledge, 781
 Kolutchin Id. and Bay, 708
 Kolo Point, 1101
 Koloa Point and Bay, 1100,
 1101
 Koloschenak Archipelago,
 594—634
 Kolui Point, 1081
 Komagadaki Peak, 860
 Komandorski Islands, 721
 Kome jima, 909
 Ko Minasi sima, 796
 Ko minato Point, 848
 Komisang Island, 1156
 Komoda Bay, 893
 Komodoopappa Island, 1105
 Komo-no saki, 893
 Komo saki, 804
 Komox, 475
 Kona, 1080
 ——— Peak, 1101, 1102
 ——— Point, 1105
 Kona-ura, 835
 ——— King Willem III. Id., 845
 Kona-ura Island, 680
 Koniugi Island, 679
 Konniga Island, 681
 Konohannui Mountains,
 1093
 Ko no se, 797
 Ko no ura, 891
 Kona sima, 821
 Konstantinovski, 762
 Konyam Bay, 712
 Ko-og-sima, 798
 Koolan, 1094
 Kooa Bay, Head, and River,
 286-8
 Kooilvac River, 691
 Kootzahoo & Roads, 613
 Kooze no ura, 884
 Koprino Harbour, 449, 450-1
 Korack Island, 1011
 Korai-no-se Rock, 892
 Kores, 767
 ——— Strait, 781, 783, 881,
 915, 1185, 1190, 1263
 Korodo Island, 1024
 Korovinshala Bay and Har-
 bour, 679
 Korovinshki Volcano, 678
 Korrer Island and Harbour,
 1011, 1012-13
 Korsakof, Cape, 765, 766
 Korsakov Island, 769
 Koru sima, 1155
 Kosaka Channel, 891
 Kosakevitch Bay, 760
 Kosaki sima, 799
 Kosado, 902
 ——— Strait, 791
 Koselskoi Volcano, 731
 Koshiki Islands, 910-12
 Koshi no se, 891
 Ko Shirashi Rock, 895
 Ko sima, 785, 787, 819, 852,
 861
 Ko sima no hana, 787
 ——— Rock, 897
 Kosime no cosima, 799, 881
 Koslof, Cape, 728
 Kosmin Bay, 773
 Kosounai, 757, 769
 Kosol Reef, 1011
 Kosu sima, 829, 843
 Kotame Bay, 908
 Kotake Rock, 888
 Ko tate, 914
 ——— Islet, 890
 Kotosok Harbour, 613
 Koto no ura, 908
 Kotovy Islands, 704
 Kotsi Inlet and Light,
 787
 Kotsu sima, 881
 Kotzomura, 830
 Kotzebue Sound, 699
 Kou Island, 694, 607
 Koubah Island, 1168
 Kougaia Island, 670, 671
 Kougote, 521
 Kougonan, Cape, 711
 Kouvaem, River, 717
 Ko ura, 809
 Kouskoquin River, 689
 Koutchougoumet, 687
 Koutousof, Cape, 686
 Koutzon, Fort, 693, 613
 Kouzmichtcheff, Cape, 726
 Kovrovskai Bay, 679
 Kowa River, 288
 Kowoa Reef, 1143
 Kowroa Point, 1081
 Kowroa, 1082
 Koyaki sima, 901, 502
 Kosa gawa, 816-17
 Krachennikoff, Cape, 725
 Kraft, 748
 Krenitsen, Cape, 738
 Krenitsin Island, 671
 ——— Point, 685
 Kresta Gulf, 718
 Krilon, Cape, and Light-
 house, 753-4
 Kritskoi Island, 685, 686
 Kricougoun, Cape, 719

Kronotskoi, Cape, and Volcano, 728
 Krulu Island, 1023
 Kruglaya, Mount, 774
 Krutlov, Cape, 773
 Krusenstern Cove, 719
 ——— Island, 698
 ——— Islands, 960
 ——— Rock, 1123
 Kruzov Island, 619, 626
 Kryoi Island, 682
 ——— Islands, 669, 681-3
 Kubaki no ura, 888
 Kuchinotsu Harbour and Light, 807
 Kuchui River, 746
 Kudaka Island, 1154
 Kudo Bay, 869
 Kuogdagh Island, 667
 Kura Channel, 594
 Kuhushan Point, 480
 Kui Island, 1154
 Kaji Mura Bay, 1148
 Ku-kien-san Island, 1157, 1158, 1161
 Kuki saki, 818
 Kulauloa, 1093
 Kulich Rock, 631
 Kul-tow-sia, 581
 Kulukak, River, 688
 Kumago Bay, 795
 Kuma-sima Harbour, 786
 Kum-on-lon Inlet, 637
 Kumi Head, 1151
 ——— Island, 1157, 1161
 Kumowadah, 536
 Kumukahi, Cape, 1073
 ——— Passage, 1103
 Kunashiro Island, 736, 741, 867
 Kunasiri Island and Channel, 741-2
 Kung, 584
 Kun-ga Island, 576, 577
 Kuno-sima, 793-9
 Kuolaa, 1094
 Kupa-sima, 1155, 1156
 Kuper Island, 377
 ——— Port, and Island, 587-8
 Kuprianoff Island, 603, 608
 Kura no hana, 891
 ——— sima, 812
 Kuria Island, 939, 945
 Kurihama, 834
 Kurilo Islands, 591, 736-742, 1169, 1182, 1187
 ——— Strait, 736
 Ku-rim-sh Island, 1160
 Kuri no kami, 882
 ——— Reef, 914
 Kuro iwa, 865
 ——— Kami Rock, 912
 Kuro ko sima, 887
 Kuromi sima, 898
 Kuromo so, 891
 Kuro no seto, 908
 Kuro saki, 853, 897
 Kuro so, 899

North Pacific.

Kuroshi, 896
 Kuro-sima, 783, 804, 885, 888-9, 895, 1144
 ——— Rocks, 816
 Kuruma no seto, 797, 799
 Kuruma Strait, 797-8
 Kusago Island, 978-7
 Kusakabe, 802
 Kusakaki sima, 1144
 Kushankotan, 764
 Kuishi ura, 990
 Kushnou, 813
 Kusimoto, 815
 Kusi saki, 792
 Kusowime River, 649
 Kusodomari, Cape, 957
 Kusunai, 1184
 Kusuri, 865
 Kusazuri Point, 892
 Kutkwutlu, 617
 Kutano sima, 1145
 Kutano so, 890
 Kutusoff, Cape, 869
 ——— Islands, 960
 Kuwan-on saki, and Light-house, 834, 841
 Kwachak, River, 688
 Kwadelon Islands, 965
 Kwajalein Island, 964, 965
 Kwakshua Channel & Rock, 520, 524
 Kwich-pak, River, 691, 692
 Kuz-gool Inlet, 537
 Kyangle Island, 1011
 Kyghynin, Cape, 713
 Kynumpt Harbour, 528-9
 Kyoko Island, 1155
 Kyuquot Hill, 438
 ——— Channel 437, 438
 ——— Sound, 401, 437-440
 Kysi, Lake, 763
 Labouchere Channel, 522
 Lachsforsell Bay, 754
 Ladle Rock, 814
 Ladrone Islands, 937, 1037
 ——— 1060, 1190
 Ladrone Islands, 30
 Lady Island, 529
 ——— Blackwood Passage, 996
 ——— Elgin Shoal, 999
 ——— Ingila Rocks, 823
 Lao Islands, 962, 964
 Laoda Reef, 640
 Laelon Point, 1094
 Lao o ka Laau Point and Light, 1092
 Lagediak Strait, 959
 Lagoon Head, 195
 Laguna, Morro de la, 90
 ——— Point, 215
 Lahaina and Light, 1087-8
 Lajas River, 48
 Lake Island, 527
 Lak-Hou Bay, 553
 Lak-oh-witz Islands, 550
 Lalo, Point, 1051

Lama Passage, 522-3
 Lambert Channel, 473, 474, 478-9
 ——— Islands, 966
 ——— Point, 540
 Lamoliao Islands, 1007
 Lamolok Islands, 1007
 Lamotrok Islands, 1009
 Lampu, River, 67
 Lanai Island, 1065, 1090-91
 Lancha, Puerto de la, 162
 Landship Mountain, 562
 ——— Point, 533, 566, 567
 Langaligarsile Island, 1003
 Langford, Port, 433
 Langlo, Pic de, 755
 Langley, 490, 464
 Lanza Island, 513
 Laomira Island, 1125
 La Paz, Bay, and Harbour, 167-170
 ——— Bank, 999
 Lapelin Rocks, 1145
 La Perouse Strait, 755, 1183
 Lara River, 7
 Larcum Island, 564
 Laredo Sound and Channel, 527, 532, 540-42
 Larrison Point and Light-house, 770-71
 Larkins Reef, 980
 Larnie Rocks, 1144
 Larns Rys Island, 1115
 Las Animas Bay and Point, 150
 Laskir Island and Reef, 1115
 Laskock Bay, 575, 576-7
 Lasqueti Island, 473, 480, 484
 Lassiano Island, 1115
 Lassion Island, 1114
 Last Rock, 296
 Latona Passage, 483
 Latouche Island, 617
 ——— Point, 637
 Latsop River, 317
 La Union, Port, and Light, 3, 60-62
 Laupahoi, 1077
 Laura Point, 382
 Lauretano, Mar, 129
 Lauvergne Island, 994, 995
 Lava Point, 1082
 Lavandera Rock, 28
 Lavenia, Rio, 23
 Lavinia, Point, 622, 623, 624
 Lawn Hill, 581
 ——— Point, 445, 579
 Lawrence Islets, 420
 ——— Point, 353, 362
 Lawson Harbour, 538
 ——— Rock, 344, 361
 Lawyer Islands, 539
 Laxi Rock, 125
 Laxman Bay, 866
 Laysan Island, 1113-14

- Laysana Rys Reef, 1115
 Lazaref, Cape, 757, 765, 766
 Lazaro, Mount, 175, 176
 Lazo, Cape, 473, 479
 Leadbetter Point, 312
 Leading Bluff, 409
 — Cone, 444
 — Island, 438, 537, 589
 — Mountain, 426, 435
 — Peak, 482, 524, 525,
 554
 — Point, 403, 418, 544,
 566
 Leahi Hill, 1697
 Lebedevski Islands, 764
 L'Echiquier Islets, 1016
 Leda Unala, 639
 Ledge Point, 504
 Ledianaya, River, 717
 Lee Bay, 181
 — Rock, 502
 Leech Island, 386
 Lees, Point, 597
 Legamo Bay, 21
 Legarde Rock, 1108
 Legrip Islands, 959
 Lehua Island, 1105
 Lele, Port, and Island, 976,
 977
 Lemaurier Island, 622, 623
 Le Mesurier, Point, 609
 Lemon, Mount, 608
 — Point, 9
 Lempa, River, 3, 54, 67-8
 Lenartev Islands, 29
 Lengua Point, 181
 Lenna Island, 1064
 Leon and Lake, 3, 45, 50-51
 Leonard Island, 419
 Leones Island, 19
 Leonovitch, Cape, 685
 Leskoff, Cape, 685
 Lesnoi Island, 627
 Lesseps Point, 762
 Letum Bay, 672
 Leuen Island, 956
 Leveron, Cape, 763
 Lewis Channel, 489
 — Island, 538
 — Passage, 524, 543
 — Reef, 402
 — River, 305
 Lexington Reef, 1151
 Liak, Cape, 761
 Lialushigh Island, 667
 Liancourt Rocks, 916
 Lib Island, 962, 965
 Liberia, 31
 Libertad Bay, 143
 — Port, 23, 64, 68-9
 Liddell Point, 380, 381, 382
 Liddle Island, 565
 Lighthouse Island, 469, 472
 — Rocks, 665
 Lihue, 1101
 Likiep Islands, 952, 959
 Lileb Islands, 965
 Lilooet Lakes, 487
 Limantour, Estero de, 255
 Lime Point and Bluff, 244
 Limestone Island, 449, 497
 — Islets, 578
 — Rock, 575
 Limit Island, 526
 Limon, Port, 38
 Limona Bay, 173
 Lampa Concepcion, Punta
 de la, 217-18
 Lina Island, 579
 Lind, Cape Van der, 740
 Linda Rock, 1138, 1139
 Linden, Cape, 775
 Lindenber Bay, 628
 Lindsay Island, 1060
 — Port, 886
 Linetskoy, Cape, 748
 Linghai Mountain, 718
 Linnea Islands, 968
 Linachoten Islands, 1144-6
 Lisburne, Cape, 699-700
 Lisi Island, 773
 Lisiansky Island, 1114-15
 — Strait, 624
 Liso Point, 17
 Litvenich Bay, 735
 LITTLE ISLANDS, 704
 — Islets, 373
 — Hat Rock, 156
 — Karaghinsky Island,
 721
 — Kiaka Island, 682
 — Kurie Strait, 737
 — Sitkhin Island, 682
 Lituya Bay, 635
 Lau-kiu Islands, 1146-1156
 Livingston Island, 996
 Lizard Point, 103, 562
 Lizzie Hill, 564
 Lloretto, 159
 Llorona, Punta, 54
 Lloyd, Port, 1128, 1131,
 1132-3
 Lobos, Cape, 142
 — Island and Point,
 136
 — Island and Rock,
 170
 — Point, 162, 167, 180,
 230, 241
 — Rock, 154
 Lost Harbour, 985
 Loffhoff, Cape, 741
 Lofly Island, 547
 Log Point, 448, 580, 587
 Logan Inlet, 677
 — Point, 505
 Logo, River, 837
 Loma, Point, and Light-
 house, 208, 209, 210
 Lona Cone, 421, 425, 442
 — Mountain, 241
 Loney Island, 1158
 Long Arm, 579
 — Bay, 419
 — Harbour, 380
 — Island, 314, 359, 549,
 606, 622, 656, 657, 1010,
 1023
 Long Point, 515, 517, 518
 Loo-choo Islands, 1146-
 1156, 1262
 Loof Island, 1016, 1017
 Lookout, Cape, 293-4
 Look-out Island, 418, 441
 Lopatinsky, Mount, 762, 768
 Lopatka, Cape, 735-6, 743
 Lopez Island, 345, 351, 352,
 355, 359
 — Sound, 350
 Lord Island, 433
 — Islands, 560
 — North Island, 1026
 Lorenzo Point, 6, 10
 Loreto, 128, 159-160, 169,
 205
 Leap Island, 990-91
 Loocoi Bay, 754
 Lot's Wife Rock, 547
 Lottin, Port, 976
 Louisa Island, 990
 Loughborough Inlet, 497
 Loughounor Islands, 991
 Louis, Port, 768
 Louisa, Cape, 872, 879
 — Point, 615
 — Rock, 379
 Louise Island, 576, 577-8
 Louisade Archipelago, 1017
 Loucoone, 573, 588
 Low Island, 362, 372, 529
 — Island and Rocks, 630
 — Islands, 577
 — Islet, 856, 862
 — Islets, 445
 — Peninsula, 419
 — Point, 312, 630, 862,
 627, 761
 — Reef and Lighthouse,
 20
 — Rock, 434
 — Rocks, 573
 — Table Point, 774
 — Woody Islands, 928
 Lowe Inlet, 536
 Lowenorn, Cape, 753
 Lowenorn, Cape, 751
 Lower California, Coast of,
 127-9, 130, 147-203,
 1174-6
 — Kamehathia, 727
 Lucan, Point, 623, 624
 Lu-chu Islands, 1146-1156,
 1262
 Lucat, Cape, 293
 Lucy Island, 558, 558
 — Islands, 550-51
 Ludlow, Port, 340
 Lugren, Cape, 711
 Luké, 776
 Lukonor Islands, 991-2
 Lukonos Island, 954
 Luminan Reefs, 1044
 Lemmi Island, 347, 354
 Luna, Estero de la, 136
 Lunden, Cape, 775
 Lungur Rock, 982
 Lupona Point, 166, 171

Lata Island, 1047
 Lautke, Cape, 670
 — Harbour, 710
 — Island, 996
 Luxana Bay, 572
 Luz, Point La, 172
 Lyall Harbour, 367
 — Point, 417
 Lydia Island, 1000
 — Islands, 965
 Lyell Island, 575-6
 Lynch Cove, 342
 Lynn Channel, 609, 614-17
 Lyons River, 773
 Lyra Island, 1154
 Lyre River, 328
 Lytton, 469
 Maast Island, 583
 Macapulo Island, 134
 Macarius Island, 702
 Macartney, Point, 608
 MacAskill Islands, 978
 Macaulay Point, 399
 Mackaw Reef, 977-8
 McCauley Island, 546, 549
 McClellan Rock, 628
 McDonald Creek, 268
 Macdonion Reef, 830
 McGrath, Mount, 540
 Machagusta, Piedra do, 89
 Machama, 850
 Mack Reef, 280
 McKay Cove, 578
 — Beach, 534
 — Reef, 420
 McKaye Harbour, 359
 Mackenzie Islands, 1004
 — Point, 654
 — Sound, 503
 Mackerrey, 1089
 Mack's Arch, 267, 280
 McLaughlin Bank, 997
 — Bay, 523
 — Point, 399
 McLeod Harbour, 647
 Macnamara, Point, 603
 McNeil Bay, 401
 — Island, 339
 McNeill, Port, 504
 Macroon Hill, 583
 Mad River, 271, 272
 Madamet Island, 968
 Madan, Point, 601
 Madara sima, 886
 Made iwa, 868
 Madera Volcano, 46, 49
 Madison Island, 931
 — Port, 335
 Madre, Sierra, 73, 130
 Mae sima, 804
 Magallanes, Sea of, 1233
 Magdalena Bay and Gulf, 180-5
 Magdalena Island, 112
 Magno no sima, 1142-3
 Maghyr Island, 997
 Maghyrarik Island, 997

Magicienno Bay, 9, 1053-4
 Magin Saddle, 509
 Magnetic Island, 23, 24, 25
 MAGNETIC VARIATION, 1228-1229
 Mago saki, 810
 Maguire, Mount, 394
 Mahloue Hill, 1047
 Mahukona, 1078
 Maiane Island, 946
 Maidel Point, 772
 Maikirima Islands, 1155
 Main Passage, 524, 660
 Majaguay Islet, 10
 Majuro Islands, 952, 955
 Makahanaloa Point, 1075
 Makaruru Island, 739
 Makarushi Island, 738
 Makanuona Point, 1100
 Makapua, Cape, 1093
 Makoo's Landing, 1089-90
 Makeua, 1089-90
 Make sima, 783
 Makhnati Island, 631
 Makin Island, 937, 949
 Maki sima, 907
 Makouchensky Bay, 674
 Makua Bay, 1093
 Makura Bay, 916
 Maia, Cape, 6, 17, 1249
 Mala de los Indios, Punta, 35
 Mala Point, 36, 42
 Malabrigo Islands, 1127
 Malacca Passage, 539
 Malacca Harbour, 1012
 Malaspina, Brazo de, 489
 — Cape, 871
 — Strait, 473, 485
 Malcolm Island, 505
 Maldonado Point and Shoals, 96-7
 Maleone Island, 1034
 Malakope Islet, 442
 Maloon Island, 1034
 Malmesbury, Port, 607
 Maloclat Islands, 952, 957-8
 Maloyama Bay, 870
 Malpelo Island, 923
 Malte Brun Point, 768
 Ma-min River, 583
 Mamori, Cape, 1024
 Mana, Point, 1101, 1102
 Managasa Island, 1052, 1053
 Managua and Lake, 3, 45, 48, 50
 Manaita Rocks, 791, 794
 Mana-Souari Island, 1024
 Manati, Cape, 721
 Manatsuru Promontory, 829
 Manby, Point, 638
 Manchuria, Coast of, 757, 767-776
 Mandarin Bluff, 836, 840
 Mangles Point, 159
 Mangion, 134
 Mangrove Bluff, 103
 — Island, 181

Manga Islets, 1056, 1058
 Mangua Islet, 10
 Manguera Island, 68
 Manim Island, 1023
 Manjias Islands, 1058
 Manjur Bay, 769
 Mannajeu Lank, 997
 Man-of-War Cove and Light, 182-3
 — Rock, 1112
 Manainian, 1024
 Mantapeti Islands, 982
 Manuel Antonio Islet, 38
 — Rodriguez Reef, 1036
 Manuela Lagoon, 195
 Manzanilla Bay, 104-6
 Manziu Island, 792
 Maple Bay, 376
 — Point, 476, 544, 567
 Maquinna Point, 428, 429
 Mar, Hacienda del, 121
 Marabios Volcanos, 51
 Maraki Island, 939, 948-9
 Mararet Islands, 1127
 Marble Rock, 544
 Marchant Rock, 545
 Marcus Island, 1125-6
 Marey Channel, 181
 Mare Island and Light, 248-9
 Margaret Islands, 1127
 Margaretta Islands, 965
 Maria Island, 940
 — Point, 196
 — Rock, 192
 — Shoal, 932
 — Luxara Island, 1108
 — Madre Island, 113
 Mariana Islands, 1037-1060, 1169, 1190, 1196
 Marias Islands, 112
 Mariato Point, 18
 Mariensk Post, 765
 Marière Island, 1026
 Marietas Islands, 111
 Maritch River, 712
 Mark Islet, 407
 — Nipple, 524
 — Rock, 522
 Markiana Island, 682
 Marmot River, 607
 Marmurika Rock, 818
 Marnata, 101
 Maro Reef, 1112-13
 Marques del Valle, Porto del, 168
 — Port, 98
 Marquesas Islands, 1258, 1266
 Marquis, Point del, 180
 Marquez Bay, 161
 Marnack Island and Rock, 537
 Marrowstone Point, 332
 Marsden, Point, 613, 614
 Marsh Reef, 1149

- Marshall Archipelago, 950-970, 1200
 — Island, 936, 947, 948
 — Islands, 937, 1126-1127
 — Point, 485
 Martin Island, 486
 — Perez Island, 53
 Martires Islands, 997
 Marugame, 800
 Marukama Islets, 802
 Maru yama, 810
 Maru-yama Point, 814
 Marvinas Bay, 430
 Mary Basin, 433
 — Cape, 750
 — Cove, 531
 — Island, 490, 491, 528, 529, 595
 — Todd Islet, 401
 Masachapa, 48
 Masapa, 48
 Maskelyne Point, 556
 Maski, 871
 Masnapi Island, 1024
 Massachusetts Island, 1115, 1123
 Massacre Bay, 363, 683
 Masset Harbour, Sound, and Inlet, 570, 582-3
 Masterman Islet, 507
 Masui sima, 790, 791
 Matador Island, 988
 Mataga saki, 852
 Matapala, Cape, 32
 Mata sima, 800
 Matachingai Mountain, 719
 Matsua Island, 738
 Mat-dotas Islands, 1007
 Matenchon, Ensenada, 116
 Mathews Bay, 1155
 Mathieson Channel, 529
 Matia Island, 364
 Matilda Cove, 426
 Matikemtas Passage, 544
 Matoya Harbour and Light-house, 820
 Mataseo, 780
 Matsima, 884, 890, 901
 Matsuga saki, 873
 Matsuhama, 799
 Matsumai, 858, 861
 Matura, River, 883
 Matsui saki, 876
 — sima, 798, 803, 915
 — Bay, 860
 — ura, 803
 Matterer Bay, 1021
 Matthew Island, 936, 943
 Mattole River, 267
 Matty Island, 1017
 Matu sima, 910
 Matvoi Island, 703
 Maucka Cove, 758
 Maude Island, 496
 Maude Island, 474, 579, 580
 Maui Island, 1066, 1071, 1085-1090
 Mauna Haleakala Mountain, 1086
 — Hualalai Volcano, 1072, 1080
 — Kea Volcano, 1072
 — Lea Volcano, 1069-1070, 1072, 1085
 — o Eoka Mountain, 1086
 — Worreray Volcano, 1072
 Maury Passage, 361
 Mauvais Accueil, Port du, 985
 May, Port, 771
 Maynaka, 822
 Mayne Island, 368, 417, 458
 Mayo, Rio del, 136
 Mayor Channel, 401-2, 404
 Mazarredo, Brazo de, 485
 Mazatlan and Light, 43, 115, 117, 121-6, 1239, 1250
 Maze Islands, 519
 Mamo Mount, 198
 Meaburr Island, 989
 Meac sima, 898
 Meares, Cape, 294
 — Island, 421-2
 — Port, 606
 — Reef, 1138, 1139
 Mechudo Head and Mountain, 165, 167
 Medidor Island, 21, 22
 Medinilla, Farallon de, 1054-5
 Medny Island, 721, 722-3
 Meduro Islands, 955
 Medusa Reef, 1145
 Meek Island, 965
 Meetchken, Cape, 718
 Megami Point, 902
 Monaco-sima Islands, 1157
 — 1163, 1260
 Mengesville, 265
 Menghyngai Mountain, 713
 Meji Island, 968
 Meja Island, 148
 Mejena Island, 876
 Meji Maru Rock, 849
 Mejit Island, 962, 960
 Mekari seto, 797, 798
 Mela Head and Lodge, 831, 840, 848
 Melish Bank, 1124
 Mellu Islands, 965
 Melones Island, 16
 Melville, Port, 1150, 1154
 Memoyah, 856
 Menalai Rocks, 915
 Menchikoff, Cape, 686
 Mendocino Bay and City, 264-6
 — Cape, & Light-house, 204, 266-7
 Menabikof, Cape, 765
 Mentchikoff Islands, 962, 964-5
 Menzies Bay, 495, 497
 Menzies, Point, 521
 Merat Island, 1022
 Mercenarior Point, 180
 Merion Harbour, 1042
 Mertons, Cape, 712, 713
 Mertons Monument Peak, 976
 Mesa Island, 1062
 Mesa de Roklan, 57
 Mesaki, 910
 Mestas de Juan Gomez Mountains, 202
 — Narvaes Hills, 180
 Méso Rock, 854
 Me sima Group, 898
 Meskarar Islet, 1024
 Mesurior, Point, 642
 Metalamin, Port, 985
 Metalanion Harbour, 979, 985-6
 Metchigra, 711
 Metchigmenak Bay, 711
 Metlah-Catlah Bay, 530, 551-2
 Mexicana Point, 609
 Mexico, 115
 — West Coast of, 203, 1172, 1173-4, 1174
 Miali Island, 960
 Mia-ga sima, 908
 Miaki Island, 844
 Miako, 789, 807
 Mia sima, 894
 Miyoshi minato, 1158
 Michael Seymour, Port, 774
 Michaelovski, Port, 692
 Michitoyat River, 75
 Michoscon, 81
 Micronesia, 937, 972
 Mid-channel Rock, 1135
 Middle Bank, 303, 360, 366, 470
 — Ground, 792, 794
 — Passage, 540
 — Reef, 434
 — Rock, 511, 526
 — Rocks, 548
 — Haero Channel, 355
 — 364
 Middlebrook Islands, 1117
 Middleton, Cape, 1031
 — Island, 642
 Midway Islands, 1117-1123
 Midzu-no-ko, 788, 802
 Midzu sima, 889
 Miya Point, 42
 Mihara Volcano, 842
 Mikawa Bay, 822
 Mikomoto Island & Light-house, 826, 1186
 Mikoto sima, 890
 Mikuni Roads, 877
 Mikura Island, 844
 Miku ura, 879
 Milbank Sound, 522, 526-8
 Mile Rock and Breaker, 443
 — Rocks, 242
 Miles Cone, 508, 510

Mili Islands, 562-4
 Milioutina Point, 761
 Mill Creek, 472
 Mille Islands, 952, 954
 Minago Point, 903
 Miname ura, 795
 Minamise Rock, 889
 Minando mura, 836
 Minasi sima, 796
 Minato gawa, 821
 Minato-mats Bay, 873
 Minera Bay, 382
 — Channel, 372
 Mingan Rock, 768
 Mink Trap Bay, 546
 Mino sima, 879
 Minotoyo Bay, 810
 Minto Breakers, 990
 Miozani yama, 832, 841
 Miosima sima, 816
 Miojin Island, 799
 — saki, 834
 Miomaga Island, 1024
 Miosazusa Island, 1023
 Miramontes Point, 236
 Mira-por-vo Shoal, 1051
 Mi saki, 788
 Misaki Bay, 906
 Mi sima, 889
 Misima Nada, 788, 796
 Misipi Island, 1033
 Mission Mountain, 552
 — Point, 551
 Mississippi Bay, 836
 Mistaken Island, 475
 Misurri Harbour, 880
 Mita, Punta, 111
 Mitake Island, 844
 Mitarai, 799
 Mitaziti, 796
 Mitchell Bay, 504, 505
 — Harbour, 587-8
 — Island, 935
 — Point, 602, 603
 Mitkoff, Cape, 685
 Mitsu iso, 833
 Mitsuga Hama, 796
 Mitsuna Islet, 1159, 1160
 Mittenatch Island, 479
 Mituzoo Rocks, 900
 Miwara, 799
 Miyadzu Harbour, 877, 878
 Miyako Bay, 853
 — guchi, 1151
 Miya no saki, 820
 — no ura, 890, 898
 — saki, 812
 Miyoso Rock, 876
 Mize Rock, 889
 Mori Island, 1001
 Modoo-papappa Island, 1105
 Moduente Islet, 1092
 Modu-manu Island, 1105
 Moell's Arch, 267
 Moffat Islands, 659
 — Rock, 508
 Moffet, Cape, 685
 Mofia Islet, 1024
 Mogi Bay, 906

Mozmog Island, 970, 1004,
 1005
 Mogote, 48
 — Peninsula, 168
 Moguemogue Island, 1005
 Moira Sound, 600
 Mokapu Peninsula, 1093
 Moke-tas Island, 439
 Mekhouvey Peninsula, 768
 Mokil Isles, 978
 Mokor Island, 993
 Moko sima, 885
 Mokuo Niki Islet, 1092
 Mole Reef, 1156
 Molegojok, 1012, 1013
 Moleje, 155-6
 Moller Bay, 686
 — Island, 1113
 Molokai Island, 1065, 1071,
 1091-2
 Molokini Island, 1064, 1090
 Moluili Bay, 1093
 Mombeta, 868
 Momobacho Volcano, 46,
 48, 55
 Momo sima, 800
 Momotombita Peak, 51
 Momotombo Volcano, 3, 51
 Momotori sima, 821
 Mona Island, 27
 Monarch Head, 367
 Monday Shoal, 449
 Monjea Bay, 214
 Monita Bay, 22
 Monitas Islands, 27
 Monjes Islands, 1062
 Monjos Islands, 1015
 Monkonusby Island, 738
 Monks Islands, 1015
 Monneron Island, 766
 Monserrate Island, 163
 Montagu Channel, 482
 — Island, 643, 647-8
 Montague Harbour, 383
 — Island, 145
 Montana Rock, 173
 — Point, 237
 Monterey, Bay of, 194, 205,
 232-4, 238
 Monterey River, 233
 Monteverde Islands, 988
 Montgomery Islands, 1156
 Monticello, 308
 Montijo, Bay of, 18-19
 Montuosa Island, 30
 Monument Point, 142
 — Rock, 575, 1032
 Moody, Port, 464, 465, 467-8
 Moore Channel, 587
 — Head, 572
 — Isle, 1011
 Morai, Cape, 944
 Mordvinoff, Cape, 670
 Moreno Rocks, 164
 Moresby Island, 374, 571,
 573, 579, 587
 — Passage, 365, 373
 — Port, 1017
 Mori Roads, 863

Morioka, 850
 Morjovi Island, 703, 704, 70
 Morjovskoi, 686
 Morjovy, 668
 Morlovinov Bay, 752
 Morning Reefs, 536
 Moro Island, 212
 — Rock, 229
 Moroihi Reef, 831
 Morokini Island, 1090
 Moro saki, 822
 Moroshetchnoe River, 744
 Morotai Island, 1091
 Morotau Bay, 803
 — no sima, 860
 Morotzu, Cape, 790
 Morrill Island, 1123-4
 Morris Bay, 530
 — Reef, 628
 Morrison Rocks, 1144
 Morro, Cerro, 87
 — Redondo Point, 192
 — Rock, 99
 Morrocinne Island, 1090
 Morse Island, 371
 Morse, 685
 — Island, 703, 707
 Morskia Matuga Islands,
 744
 Mortlock Isles, 970-1, 991-3
 Mosquito Harbour, 422
 — Passage, 371
 — River, 774
 Moss Passage, 530
 Mostrador Bay, 173
 Motogoeu Island, 1002,
 1003
 Motomi, Mount, 1143
 Moto yama and Shoals,
 794, 795, 796
 Mouatt Channel, 402
 — Reef, 401
 Mongoul Island, 978
 Moule Bay, 768
 Mouravieff, 755
 Mourileu Islands, 996
 Mouse Rock, 528
 Mowee Island, 1085
 Mowitch River, 270
 Mozi saki, 793, 794
 Muchalat Arm, 431
 Muckahwanne, 565
 Mud Bay, 623
 — Islands, 563
 Mudge, Cape, 322, 473, 480,
 494
 — Island, 387, 473
 Muela Islet, 23
 Muella Rock, 71
 Muerto, Punta del, 23
 Muertos Bay, 173
 — Island, 28
 Mugi saki, 819
 Mugu, Point, 215
 Mukai sima, 799
 Mukitoo, 342
 Mulego, 155-6
 Mulgrave Islands, 952
 — Port, 637

- Mullins Island, 414
 Muloffsky, Cape, 752
 Multonomah Island, 309
 Mumenoki, 901
 Mumford Landing, 539
 Mura Harbour, 819
 Murato saki, 787
 Muravief Promontory, 770
 Muravief Post, 1184
 Murchison Island, 675
 Murchisago Islands, 43
 Murder Cove, 608
 Murosu no se, 804
 Musgrave Islands, 978
 Musahi sima, 797
 Mu sima, 790, 891
 Musir Islands, 738
 Musoir Rock, 768
 Musquillo Islands, 965
 Musket Island, 966
 Mussel Inlet, 531, 532
 ——— Rock, 421
 Musell Point, 859
 Mutine Point, 497
 Mutiny Bay, 333
 Mutina Bay, 735
 Mutok Island, 982
 Mutokaloj Islet, 982
 Mutsure Island and Light-house, 790-1
 Mutsu sima, 800, 895
 Muxon, Cape, 606
 Mylor Peninsula, 562
 Myrup, 737
 Mysory Islands, 1022, 1024
 Mystery Rock, 488

 Naa Island, 985
 Nab Rock, 541
 Nabae sima and Light, 800
 Nacaome River, 58
 Nacacolo, Port, 45, 47
 Nadergeda Island, 741
 Naden Point, Harbour, and River, 584
 Nadeshta Bay, 750
 Nadijeda Bay, 750
 ———, Cape, 851
 ———, Strait, 739
 Nagahama, 807
 Naga hama ura, 802
 Nagamo Reef, 852, 914
 Nagano sima, 900
 Nagarobe sima, 1143
 Nagasaki, 777, 779, 780, 781, 903-4, 1262, &c.
 ———, Bay of, 898-906
 ———, Harbour, 902-6
 ———, bana, 909
 Naga saki, 795
 Nagasama sima, 851
 Naga sima, 908
 Nagasu no ura, 807
 Nagato, 795
 Nagato sima, 707
 Nagay Island, 666
 Naginato Rock, 901
 Nagounalaska Island, 672
 Nagoya, 807

 Naguh, 1153
 Naguiccolo, Port, 47
 Nag ura, 818-19
 Nahmint Bay, 410, 412
 Nahwitti Bar or Lodge, 607, 599-610
 Nai-koon Hill, 482
 Naipupu, 1083
 Naizues Spit, 582
 Naiya ura, 819
 Najases, 759
 Nakadori Channel, 853
 ———, sima, 892-3
 Nakai no sima, 884
 Naka Koshika, 911-12
 ——— no se, 802, 912
 ——— no sima, 787
 Nakase, 810
 Naka sima, 1148
 Nakat Inlet, 560
 Nakhodka Bay, 773
 Nakko Head, 766
 Naknek, River, 687
 Nak-wak-to Rapids, 511-12
 Nalap Islands, 983
 Nalatcheff, Cape, 728
 Nalan Island and Passage, 520, 524, 525-6
 Nama Island, 991
 Namaar Island, 993
 Nama ura, 892
 Nambu, Cape, and Light-house, 853
 ———, Peninsula, 856
 Namingawa, 848
 Namiteruma sima, 1158
 Namoliaour Islands, 1000
 Namohipifane Islands, 996
 Namoluk Islands, 993
 Namonuito Islands, 996-7
 Namorik Islands, 962, 968
 Namou Islands, 965
 Namoune Island, 996
 Namourousse Island, 996
 Namouttek Islands, 1000
 Namtui-Roj Island, 965
 Namu Harbour, 520
 ———, Islands, 962, 965-6
 Namureck Island, 967
 Namurrek Islands, 1000
 Nanaimo Harbour, 372, 380, 469-471
 Nanao Harbours, 875-6
 Nana shima no seto, 783
 Nana sima, 877
 Nanavabe, 1073
 Nanek, River, 687
 Nangoya, 822
 Nanuak Island, 667
 Nanose Harbour, 474
 Nanori Rock, 893
 Nanountoughtat Lake, 660, 687
 Nanouki Island, 944
 Nanouti Island, 943-4
 Na Pali Point, 1101
 Napha-kiang Harbour, 1150-3, 1262
 Napoleon Gulf, 772

 Naranjas Island, 18
 Naranjo Point, 35
 Naranjos Islets, 36
 Narrow Island, 385, 430, 524
 Narrowgut Creek, 438-9
 Narani Rock, 791, 794
 Naru sima and seto, 893-4
 Naruto Passage, 803, 804, 809-811
 Nasaal Rock, 314
 Nasa Bank, 479
 Na sima, 884
 Nasoga Gulf, 562
 Nasparti Inlet, 441, 442-3
 Nasa Bay and River, 456, 562-4
 Nasa-too Island, 314
 Nata, 11
 Nat-a-hats Bay, 294
 Natchikinskoi, Cape, 726
 Nathan, Cape, 44
 Natividad Island, 192
 Natsungu saki, 879-880
 Natsu sima, 856, 857
 Nautilus Reef, 1139, 1130
 ———, Shoal, 941
 Navachista, Boca, 134
 Navarin, Cape, 720
 Navidad Bay & Head, 107-8
 Navy Channel, 368
 Nawilwih Harbour, 1100-1
 Nawodo Island, 950
 Nawugrah River, 293
 Nayadnik Bay, 772
 Nax Harbour, 1148
 Ne-ah-kah-nio Peak, 298
 Near Island, 656
 ———, Islands, 683
 Nevas Island, 1115
 Necheeno River, 293
 Nechisona Rock, 897
 Neck Point, 362, 515
 Necker Isle, 1109-10, 1124
 Necomanche River, 314
 Ned Rocks, 817
 Neesah Bay, 326-7, 393
 Needle Mountain, 727
 Needle Peak, 661
 ———, Peaks, 541
 ———, Rock, 434
 Needles Islets, 1136
 Neegitchan, Cape, 711, 712
 Negada Point, 19
 Negosima ura, 818
 Negrito Bluff, 23
 Negrito Rocks, 38
 Negro, Cabo, 195
 Nehalem River, 295
 Nekanekum Creek, 297
 Nekas River, 293
 Nelly Rocks, 786
 Nelson Island, 486, 487
 ———, Point, 596
 Nemoro and Light, 863, 866, 867
 Nepean, Point, 608
 ———, Sound, 545
 Neprop Islet, 630
 Nertchinsk, 763, 766

Neabitt, Point, 603
 Neatugah River, 293
 Nettle Basin, 536
 — Island, 414
 Neukah's River, 317
 Neva Channel, 619
 — Island & Shoal, 1114,
 1115
 — River, 752
 Navarro River, 264
 Nevelskoi Bay, 758
 — Cape, 764
 Neville Island, 1026
 — Port, 499-500
 Nevski Strait, 627
 New Bank, 448
 — Channel, 369, 370, 510
 — Harbour, 1012
 — Island, 1033, 1108,
 1115
 — Patch, 515
 — Point, 317
 — Aberdeen, 521
 — Albion, 204, 255
 — Archangel, 601, 632,
 1180
 — Baldayo Island, 1033
 — Britain, 1018
 — Cornwall, 455
 — Dungones Bay and
 Light, 329-330
 — Eddystone Rock, 596
 — Georgia, 301
 — Granada, Coast of, 1,
 6-31
 — Guinea, North Coast
 of, 1016, 1017-1024
 — Hanover, 455
 — Helvetia, 205
 — Ireland, 1018
 — Langley, 464
 — Market Island, 935
 — Nantucket Island, 932
 — 933
 — Orleans, 239
 — Philippine Islands,
 970
 — San Diego, 210
 — Tacoma, 338
 — Westminster, 457,
 463-4
 — Year Island, 960
 — York Island, 930
 Newcastle, 336
 — Island, 389, 471,
 472
 Newenham, Cape, 688, 689
 Newmarket, 340
 Newport, 291
 — Bay, 211
 — Harbour, 1128,
 1135
 Newumi sima, 797, 800,
 902
 Ngauangle Reef, 1011
 Ngaryk Islands, 987
 Ngatik Islands, 987-8
 Ngoli Islands, 1007-8
 Naur Island, 1015

Nicaragua, Coast of, 1, 3, 5,
 44-64, 1172
 — Lake, 3, 38,
 44, 45, 49-50
 Nicholas, Fort, 652
 Nicoya, Gulf of, 37-40, 1257
 Niegata and Lighthouse,
 770, 780, 807, 871, 873-5
 Niele Creek, 295
 Nigisi Bay, 836
 Nigo, Point, 1047
 Nigretas Rocks, 38
 Nihoa Island, 1064, 1071,
 1105-6
 Niuhau Island, 1065, 1066,
 1071, 1103-5
 Nii sima, 843
 Nijini Kamchatka, 735
 Nikla, Cape, 747
 Nikolsevak, 765, 766
 Nikolaieffsk, 1184
 Nikolskoi, 679
 Nile Rock, 486
 — Shoal, 1001
 Nimpkish, River, 504
 Ninirlioun, Cape, 717
 Ninmoichon Harbour, 976
 Nino, Rio, 38
 Ninstanta, 673
 Nioka, Cape, 1153
 Nipon Island, 778, 815-
 841, 847-857, 871, 1188
 Nipple Hill, 196
 Nishibets River, 866, 867
 Nishi no ura, 911
 Nishimoto sima, 1158
 Nishni Kamchatka, 727
 Nisnaka Bay, 795
 Nisi sima, 803, 879
 Nisi ura, 795
 Nisi-wara saki, 883
 Nismenna Point, 627
 Nusqually and River, 311,
 339
 Nitinat Lake, 406
 Niulii, 1078
 Niumalu, 1101
 Niwatori jima, 798
 Nob Islet, 562
 — Point, 409, 445
 Noble Point, 523
 Nodales Canal, 497
 Nodule Point, 333
 Noel, Port, 958
 Notitai, 857
 Nogales, 137
 Nonsak, Cape, 670
 Noka no hana, 798
 Noko-ghori yama, 839
 Nokona Island, 796
 Noko-no sima, 882-3
 Nokubi Bay, 891
 Noma no hana, 909
 Noma no take, 909
 Noma saki, 822
 Noma sima, 809
 Nomi Harbour, 787
 Nomo, Cape, and Rock, 900
 Nomo saki and Rock, 906

Nomo saki and ura, 898,
 900
 Nomo yama Point, 900
 Noneto, Cape, 741
 Nonouti Island, 943
 Noo-narbook Island, 698
 Noon-Day Rock, 269
 No-o saki, 801
 Nootka Cone, 428
 — Island, 430, 432
 — Sound, 277, 392,
 404, 426-432
 No o ze Reef, 882, 898,
 914
 No Point, Point, and Light,
 334
 Nopolo Point, 160, 164
 Nord, Ile du, 944
 Norfolk Sound, 619, 629
 Norman Point, 479
 Norris Rock, 375, 478
 North Arm, 424-5, 468, 580
 — Bay, 317, 356, 371,
 749, 750
 — Bay Reef, 814
 — Breaker, 526
 — Cape, 277, 708
 — Channel, 423
 — Harbour, 448
 — Island, 585, 660
 — Island & Ledges, 530
 — Passage, 532, 540
 — Point, 563
 — Point and Beach, 244
 — Reef, 376, 377
 — Rock, 474, 511, 549,
 823
 — Rocks, 548
 — Danger Rocks, 548
 North-east Harbour, 747
 North Eurland, 654
 — Fork, Tho, 464
 North-west Bay, 475
 — Cone, 433
 — Rocks, 548
 Northumberland, Cape, 595,
 598
 — Channel,
 470, 473
 Norton Bay, 694
 — Sound, 591, 691
 Nosaki sima, 891
 Nose Peak, 446, 448
 No sima, 891, 901
 Nosima Reef, 813
 Nosima saki and Light-
 house, 831, 840, 847
 Noosvskoi & Volcano, 670,
 671
 Nosayab, Cape, 755, 756,
 871
 Nossyam, Cape, 866
 Notch Island, 790
 Notched Hill, 474
 Notetu, Cape, 762
 Noto, Cape, & Lighthouse,
 871, 875, 876-7
 Noto jima Island, 875
 Notoro, Cape, 868

Notoro, Cape, & Lighthouse, 753-4, 755, 758
 Point, 759
 Notosama Bay, 759
 Notake Spit, 866, 867
 Nouchagak, River, 688
 Nougouoro Islands, 988
 Nounaagan Inlet, 714
 Nounisgo and Cape, 709
 Nounivak Island, 689
 Nouchagak, River, 688
 Novik Bank, 763
 Bay, 770
 Novogorod Bay, 767, 768
 Novosilrov, Cape, 870
 Novy Islands, 704
 Nowell, Point, 646
 Nowish Cove, 531
 Noyahaf, Cape, and Light-house, 863, 866
 Nubble Mountain, 548
 Nubla Island, 1031, 1032
 Nuchatlits Inlet and Reef, 433-4
 Nuevo Mexico, 130
 Nugent Sound, 512
 Nuinak Island, 666
 Nukunau Island, 940
 Nukur Islands, 988
 Nulato, 691
 Numukania Bay, 407, 411
 Nunamo, 709
 Nuniwak Island, 689-690
 Nurki Peninsula, 746
 Nutehek Bay, 643
 Nunau Valley, 1093, 1096
 Ny, River, 752
 Nyasi Point and River, 758, 769
 Nye Rock, 511
 Nygthygan, Cape, 711

 Oahu Island, 1065, 1092-9
 Oak Bay, 333, 401
 Point, 298, 308
 Oakland Harbour, 247
 Oar Channel and Reef, 1150, 1151, 1152, 1152
 Point, 546
 Oat-so-alis, 519
 Oaxaca, 81, 95
 Obama, 797, 798
 Obe Hato ura, 797
 Obiraspi River, 871
 Obispo, Farallon del, 98
 Obman Bay, 750
 Obree Channel, 886, 913
 Island, 881
 Observation Islet, 449
 Point, 551
 Observatory Inlet, 561, 564-5
 Island, 763, 854
 Islet, 411, 421, 448, 894
 Point, 328
 Rock, 872
 Rocks, 393

Obstruction Island, 424
 Island and Pas-sage, 361
 Ocean Cape, 636
 Ocean Island, 949, 1122-3
 Oda, 873
 Oda Bay and Point, 803
 Odawara Bay, 829-831, 839
 Oda yama, 810
 Oda Islands, 962, 965
 Odobe, 868
 Odemari Bay, 785-6
 mura, 818
 Odo no se, 786
 Okutsi sima, 801
 Odu-kumi sima, 821
 Odrutsu Harbour, 851, 852
 Ofuwi, Cape, 871
 Ogami Point, 902
 Ogasawara sima, 1129
 Ogawa sima, 914
 Ogden Channel, 537, 548-9
 Point, 399
 Ogo sima, 798, 810
 Peninsula, 872
 Bay, 873
 Oglo Island, 1148
 Ogiodak Island, 689
 Ohama Harbour, River, and Light, 878
 Ohara no hana, 801
 Ohata, 856
 Ohodakoo, 604
 Ohiak Bay, 659
 Ohigasi saki, 847, 848, 849
 Ohu saki, 855, 861, 898
 Ohu sima and Strait, 1147, 1148
 O Idi sima Harbour, 787
 O-iso, 811
 Ojima Island, 876
 Ojika Island, 891-2
 soto, 891
 Ojo Point, 26, 27
 Liebre Lagoon, 195
 Okado Point, 801
 Okaimon daki Mountain, 783, 910
 Okamura, 799
 Okawa Point, 873
 Oke Island and Reefs, 629
 Okebet, Cape, 740
 Okhotak, 745-6, 1183
 Okhotak, Sea of, 742-755, 1182, 1213, 1229
 Oki Islands, 879
 Oki Hilari sima, 827
 Okiho Island, 785
 Okinawa sima, 1147, 1150-5
 Oki no iso, 802
 Oki no se, 821
 Okino sima, 788, 812, 833, 879, 909
 Oki sima, 800, 801, 809
 Oki sima and Channel, 902
 Okoyama, Port, 804
 Oku-Jesso, 748
 Okushi Harbour, 894
 Okusiri Island, 869

Olap Island, 998
 Old Port, 675
 Oldham Rock, 893
 Oleander Rock, 823
 Olga Bay, 774-5
 Gulf, 619, 626-8
 Olimarao Islands, 1000-1
 Oliutor, Rock, 724
 Olivutus Rocks, 915
 Olot Island, 967
 Olukashel Island, 1012
 Olutorkoi, Cape, and Gulf, 720
 Olympia, 339-340
 Olympus Mountains, 318, 322
 Onai saki and Lighthouse, 823, 832, 839
 Onasaki sima, 856
 Onabalin Island, 963
 Onagon, Cape, 744
 Onawoon, 639
 Oni saki, 816
 O-mi sima, 799
 O-mitsu yama, 892
 Ommaney, Cape, 606, 612, 619, 634
 Omatope Volcano, 46, 49
 O mura Gulf, 890
 Omura Rock, 1143
 Onango sima, 845
 Onata Islands, 1024
 Onavero Island, 950
 Onaka, 945
 O'Neal Island, 357
 Onaal Rock, 1031
 Onceow Island, 1103
 Onemak Island, 965
 One Mile Rocks, 242
 One Tree Islet, 509, 553, 555
 Ongai Island, 978
 Ongolukkgi Eyland, 844
 Onghaahi Rocks, 843
 Onia saki, 822
 Onnebitsu Bay, 741
 Onnekotan Island, 738
 Onnodake, Mount, 1151
 Onotao Island, 941
 Onohara Rocks, 844
 Onocoun Island, 297
 Onocoun Island, 997
 Onalow, Point, 600, 602
 Onutu Island, 941
 Oo Azika sima, 887
 Oobiki ura, 812
 Oogawa sima, 884
 Oo-ghe-e-ak Rock, 698
 Ooglaamie, 700
 Ooko mura, 909
 Oona Bay, 549
 Onagare Rock, 827
 Onella Island, 674
 Onting, Port, 1150, 1154
 Oori se, 884
 Oorokoo Island, 1012
 Oosaka, 779, 789, 805-7, 837, 877
 Gulf of, 788, 805-8

Oo saki, 785
 Oo sima, 842, 852, 883, 890
 Oo sima & Lighthouse, 786
 Oosima Harbour and Light-
 house, 815-16
 Oosuka Harbour, 887
 Ootake Rock, 888
 Oo tate, 914
 Ootato sima, 889-890
 Ootzu saki, 787
 Oo ura, 803
 Open Bay, 371, 452, 491, 518
 Opocorob, 1094
 Oprichnik Bay, 776
 Orailipou Bank, 1000
 Orailuk Island, 989
 Orange Point, 496
 Orcaas Island, 351, 353-4,
 355, 362-4
 Orcaas Nob Peak, 355, 362
 Orchard, Port, 335, 337
 Oreehoua Island, 1105
 Oregon City, 309
 —, Coast of, 277-310
 Orkhor Island, 774
 Orford Bay, 494
 —, Cape, and Light-
 house, 283-4
 —, Port, 267, 282-3
 —, Reef, 284
 Oriflamme Passage, 560
 Origan River, 278
 Ori-kasa kawa, 852
 Ormed Island, 958
 Ormillas Point, 157
 Oroji, Cape, 759
 Orokes Bay, 759
 Orulong Island, 1014
 Oro no sima, 881
 Orori Volcano, 3, 44, 46
 Orori Point & Peninsula, 1044
 Ousaki Bay, 812
 —, sima, 798
 Osawa, 852
 Osborn Bay, 376
 Osborne Island, 558
 Oscar Passage, 531
 Ose saki & Lighthouse, 896
 Oshambe, 863
 Osho Rock, 909
 O Shirashi Islet, 895
 O sima, 797, 818, 819, 861,
 880, 893, 898
 Osprey Breakers, 786
 Osteonal Rocks, 44
 Ostro Point, 768
 Ostrovski Islands, 704
 Ostrovni Point, 773
 Otula River, 104
 Ota Cliff, 876
 Otai yama, 818
 Otakara Point, 896
 Otaru Bay, 870
 Otaranui, 863
 Ota saki, 869
 Otatutu, 863
 Otawa Bay, 890
 Otenek Island, 642
 Otdia Island, 958

North Pacific.

Otentosama Sea, 908
 Otterranai, 868, 870
 Otmetoloi, Cape, 761
 —, Point, 630
 Oto Bay, 161
 Otonashi, River, 817
 Oto no so, 893, 897
 Otoque Island, 17
 Ototsino, Cape, 1149
 Otr Island, 1125
 Otsiai, Cape, 760
 Otsioia Island, 628
 Otzu, 807, 877
 O-tzu-no ura, 834
 Otter Anchorage, 554
 —, Bay, 381
 —, Cove, 496, 497, 631
 —, Mountains, 379
 —, Passage, 545
 —, Point, 393
 —, Shoal, 535
 Otters, Bay of, 672, 673
 —, Isle of, 681
 —, Sea of, 661
 Oualan Island, 975
 Ochouganat Island, 652
 Ouda, River, and Fort, 748
 Oudagagh Channel, 674
 Oudskoi, Fort, 748
 Oudsky Bay, 748
 Ouektok Island, 671
 Ougagouk River, 660, 665
 Ougak Island, 656
 Ougaigan Isle, 674
 Ougamok Island, 671
 Ougatchik, River, 666
 Ougnagak, 667
 Oujak Bay, 669
 Oukamok Island, 665-6
 Oukinakoi, Cape, 724, 726
 Oukivok Island, 695
 Oubanski Bay, 748
 Ouleai Islands, 1002
 Oulemeray Island, 1003
 Ouliaga Isle, 676
 Ouliakhpon, Cape, 715
 Oulley Islands, 1002
 Ouluthy Islands, 971, 1004
 Oumaknagh Island, 673
 Oumi Aka sima, 1160
 Oumnak Island, 674-5
 Ounanga Strait, 677
 Ounalashka Island, 593, 672-4
 Ounanga Island, 672, 674, 681
 Ounalik Island, 997
 Ounatchogh Island, 667-8
 Ou-ou-Kinsh Inlet, 441-2
 O-ura, 880
 Ousouri Bay, 769, 772
 Ounga, Cape, 671
 —, Island, 666-7
 Ounimak, Cape, 688
 —, Island, 670-1
 —, Strait, 671, 677
 Ounobe yama, 802
 Outer Cape, 746
 —, Island, 541
 —, Point, 1148
 —, Reef, 819

Outer Rock, 818
 Outer Spruce Cape, 667
 Oval Hill, 557
 O Wahi, 1071
 Owara Creek, 903
 Owari Bay, 807, 821-2
 —, Gulf, 1185
 Owasi Bay, 818
 Owen Point and Island, 993
 Owhyhee, 1071
 Oyster Bay, 294, 480
 —, Harbour, 376, 377
 —, Island, 763, 764
 Ozernoi, Cape, 726
 Ozumi no hana, 796, 797
 Ozzard, Mount, 418
 Paanopa Island, 949
 Pacayo Volcano, 77
 Pacheca Id. & Channel, 7, 8
 Pachena Bay, 406
 Pa-chung-san Islands, 1157
 —, 1160
 Pacific City, 304
 Pacific Island, 1145
 Pacora Island, 21, 22
 Paddle Rock, 618
 Paddy Passage, 564
 Padilla Bay, 346
 Padras, 156
 Pagan Id., 1055, 1056, 1057
 Paghelian, Cape, 713
 Pago Harbour, 1047
 Pagoobnoy Strait, 619
 Paicpou Cove, 1047
 Pailolo Channel, 1091
 Painipete Island, 979
 Painted Rock, 1135
 Pajaro, Bahia del, 22, 23
 —, Rio del, 233
 Pajaro Island, 8, 23, 67,
 121, 123, 126, 137, 139
 —, Islets, 10
 —, Point, 23
 —, Farallon de, 1059-
 1060
 Pakeem Islands, 987
 Pakenham, Point, 645
 Pakin Islands, 987
 Pala, Point, 126
 Palao Islands, 1008
 Palau Islands, 1008-1015
 Palenque Island, 27, 28
 Paley Island, 6
 Pali, The, 1093, 1096
 Pallada Road, 767, 768
 Pallas Bay, 762
 —, Reef, 1020
 —, Rocks, 897-8
 Palliou Island, 1002
 Pallou or Pally Islands,
 1008
 Palm Point, 931
 Palma, 7
 Palmis Bay, 173
 Palmer Point, 415
 —, Reef, 1109, 1115
 Palmerston, Cape, 452
 Palmia Point, 175, 176

Palmitas, Arroyo de las, 180
 Palmito, Hacienda del, 121
 Palmyra Island, 930-31
 Palux River, 314
 Pamplona Rock, 639-640
 Panaloya River, 80
 Panama, 11-16, 1174
 Panama Bay, 6-17, 1171,
 1247, 1264, 1267, &c.
 — Canal, 13-14
 — —, Isthmus of, 1
 — —, Reef, 346
 Pan de Azúcar Rock, 39
 Pandora Cove, 221
 — Peak, 393
 — Reef, 329
 Pané Bay, 977
 Panian Harbour, 981
 Paougvigumut, 687
 Papagayo, Gulf of, 5, 41,
 1174
 Papanoa Point, 102
 Papappa Rock, 1105
 Papenburg Island, 901-2,
 905
 Papa Hills, 179, 1131
 Paramuhir Island, 737
 Pardero, Roca, 1033
 Parece Islands, 1138
 Parcoe Vela Reef, 1138,
 1139-1140
 Paridas Islands, 28-9
 Paris Bay, 770
 Parita Bay, 17
 Park Hill, 356
 Parker Island, 353
 — Point, 613
 — Reef, 358
 — Shoal, 785
 Parkin Islands, 556
 Parry Bay, 396
 — Island, 969
 — Islands, 1128, 1130
 — Passage, 585
 Partida Island, 161, 167
 —, Roca, 1031
 Partovshikov Island, 626
 Partridge Point, 331, 343
 Parum Island, 982
 Panajera, 157
 Pasley Island, 482
 Pasquel, 50
 Passage Canal, 645
 — Cone Hill, 648-9
 — Island, 465, 481, 544,
 651
 — Islet, 631
 — Reef, 814, 884
 — Rock, 10, 420, 482
 PASSAGES, 1234-1267
 General Remarks, 1234;
Great Circle Sailing,
 1234
 Cape Horn to California
 and British Columbia,
 1235-1242
 Between California and
 Australia, &c., 1242-4

PASSAGES—continued.
 Between California and
 China & Japan, 1244-6
 Between California and
 Panama, 1247-1251
 Between San Francisco
 and Vancouver Island,
 1251-2
 Between San Francisco
 and the Sandwich
 Islands, 1241, 1252
 Between San Francisco
 and Tahiti, 1252-3
 Between California, &c.,
 and Peru, 1253-4
 Between San Francisco
 and Callao, 1253-4
 Central America, Mexico,
 &c., 1254-7
 Panama Bay, 1254-5
 South America to Central
 America, 1256-7
 Between Panama & Australia,
 &c., 1257
 Between Panama, &c.,
 and China and Japan,
 1257-8
 Between Panama and the
 Sandwich Islands, 1258
 Between Panama and
 Tahiti, &c., 1258
 Between Valparaíso or
 Callao and China, &c.,
 1258-9
 Between Valparaíso or
 Callao and the Sandwich
 Islands, 1259-1260
 Between China & Japan,
 1260-4
 Between Hong Kong and
 Yokohama, 1260-2
 Between Hong Kong and
 Nagasaki, 1262
 Between Hong Kong and
 Lu-chu, 1262
 Shanghai to Nagasaki,
 1262-3
 Shanghai to Yokohama,
 1263
 Between Shanghai and
 Hakodate, 1263
 Yokohama to Hakodate,
 1264
 Between the Islands, &c.,
 1264-6
 Between Tahiti and the
 Sandwich Islands,
 1264-5
 Fiji Islands, Across the
 Equator, 1266
 Between Sandwich Ids.
 or Tahiti & Australia,
 1266
 Fiji Islands to the Sandwich
 Islands, 1266
 Marquesas Islands to the
 Sandwich Islands, 1266
 Japan to Australia, 1266
 Passarera Island, 109

Pasier Point, 1026
 Passion Island or Rock, 1029
 Pastolik and Bay, 692
 Patay, Point, 1047
 Patterson Island, 965
 Patey Rock, 374
 Patience Bay and Cape, 749,
 752
 Patino Point, 6
 Patoa, 1088-9
 Patoa Island, 143, 357, 364
 Patrocinio Island, 1123
 Patroclus Bay, 772
 Paulogue Islands, 1008
 Pavlovskia Bay, 685
 Pavon Bay, 34
 Payo Island, 25
 Passaca, Rio, 64
 Passas, Rio, 64, 74
 Peacock Anchorage, 942, 943
 — Channel, 416-17
 Peapoda Islets, 353
 Pearce Point, 550, 558
 — Rock, 819
 Peard Bay, 700
 Pearl Harbour, 554
 — Islands, 7-10
 — Lochs, 1095
 — Rocks, 515
 — and Hermes Reef,
 1116-17
 — River Harbour, 1095
 Pearce Island, 562, 565
 — Islands, 404
 Pearson Island, 486
 Pedan Islands, 1024
 Pedder Bay, 396
 — Islands, 955
 Pedernales, Point, 227
 Pedro Gonzales Island, 9
 — Nales, Point, 227
 Peel Island, 506, 1129, 1130,
 1131-4
 Peoles Island, 769
 Poguonema Islands, 987
 Peirce, Cape, 688
 Pelado Islet, 11
 Pelelop Island, 978
 Pelelew Island, 1014
 Pelew or Pellow Islands,
 972, 1008-1015
 Pelican Bay, 275
 — Island, 141
 Peligroso, Canal, 141
 Pell Island, 1114, 1115
 Pellow, Point, 645
 Pelly Island, 399
 — River, 602
 Pémé Islet, 1016
 Penas, 111
 Pender Harbour, 455
 — Island, 367, 368
 — Islands, 498
 Peninsula Point, 248, 549
 Penjina, River, 744
 Penjinsk Gulf, 744
 Penkegnei Bay, 712
 Penn Cove, 343
 — Islands, 492

Pennell Island, 1146
 Penot Point, 22
 Penrose Island, 518, 519
 Pequena Bay, 181, 187
 Percy Bay, 473
 — Point, 599
 Perlonco Islet, 25
 Peronomaia Creek, 608
 Perico Island, 13, 14
 — Point, 162, 172
 Peril Strait, 626, 627-8
 Perique Rock, 16
 Perlas Islands, 7-10
 Pernicious Strait, 619
 Peroat Island, 940
 Perpendicular Head, 431
 Perpetua, Cape, 290
 Perry Bay, 9, 10, 565
 — Island, 834, 1128, 1136
 — Rock, 367
 Perseus Rock, 797, 798
 Peru, 1263
 — Island, 936, 937, 940-1
 — Islands, 1138
 Perula Bay, 109-110
 Perui Island, 737
 Pescadore Point, 173
 Pescadore Islands, 962
 Pescadore Bay, 179
 Pestchani Point, 761
 Pestchanoi Point, 769
 Petaluma Creek, 248
 Petatlan, Morro de, 132
 Peter the Great Bay, 769—
 772, 773
 Peterel Point, 1082
 Petillo Point, 14
 Petrel Channel, 547
 — Island, 1035
 — Shoal, 517
 Petrica Strait, 655
 Petrolia, 267
 Petropaulski and Harbour,
 729, 730, 733-5, 1182
 Petrova Island, 774
 — Rock, 775
 Peveril Rock, 526
 Philadelphia Island, 1108,
 1114, 1115
 Philip Islands, 1004
 — Point, 146, 502
 Phillimore Point, 383
 Phipps, Cape, 636
 — Point, 644
 Phoebe Island, 932, 935
 Piestra, Punta, and River,
 131-2
 Pichilingue Harbour, 83,
 169-170
 Pico Channel, 741
 Pie Islands, 649
 Piedra River, 29
 — Blanca, Point, 111
 — Blancas and Light-
 house, 229-230
 Piers Island, 374
 Piguli Islet, 999
 Pigeon Island, 957
 Pigeon Island, 1128

Pigeon Point and Light-
 house, 235-6
 Pigot, Point, 646
 Pigouelao Islet, 990
 Pike Island, 551
 Pikela Island, 1000
 Pikelot Islet, 999
 Pina, Volcano de las, 3, 51
 Pillier Rock, 768
 Pillula Island, 1011, 1014
 Pillipal Island, 997
 Pillar Bay and Rock, 585
 — Point, 328
 — and Rock,
 236
 Pillarcitos, Arroyo de los,
 236
 Pilley Shoal, 448
 Pilot Rock, 271
 — Knob Mountain, 283
Pilots:
 Amur Gulf, 764
 Hakodate, 859
 Japan, 779
 Nagasaki, 905
 Pilwo, Cape, 759
 Pino, Cape, 658
 — Island, 314, 511
 Pineda, 46
 Pingelap Islands, 978
 Pinnaco Channel, 439
 — Rock, 414
 Pinnacle Island, 704, 1145
 — Islet, 448
 — Islets, 1162, 1163
 — Point, 442, 733,
 760, 775
 — Rock, 264, 326,
 1143
 — Rocks, 194
 Pinos, Point, and Light-
 house, 231
 — River, 29
 Pintada, Sierra, 190
 Pioneer Rocks, 912
 Piper Island, 627
 Pipestem Inlet, 417
 Pique Bay, 762, 776
 Piratkov, Cape, 735
 Pirie Point, 567
 Pirote, 759
 Pisayama Rock, 815
 Piscador River, 235
 Pise Island, 994, 995
 Pisorarr Island, 997
 Piti, Punto, 1045
 Pitlekaj, 708
 Pitt Archipelago, 545, 550,
 557
 — Island, 464, 518, 619,
 622, 937, 949
 Pivay Bay, 23
 Pizaras Island, 997
 Platoon Bay, 776
 Platana, Point, 31, 32
 Playa Brava, 23
 — Cerro de la, 179
 — Colorada, Boca, 134
 — Hermosa, 47

Playa Maria Bay, 196
 Pleasant Island, 950
 — Islands, 621, 1037
 Plover Bay, 715-16
 — Island, 520, 701
 — Point, 422, 543
 — Reefs, 420
 Plumper Bay, 398, 496, 498
 — Cove, 483
 — Channel, 523, 526
 — Harbour, 428,
 430, 432
 — Island, 449
 — Pass, 364
 — Passage, 403
 — Reef, 368, 366
 — Sound, 366, 367-8
 Plunger Pass, 481
 Plymouth Island, 1128,
 1135
 — Rocks, 833, 834,
 840
 Pnaougoun, Cape, 709,
 710
 Podospotchnoi, Cape, 679
 Poett Rock, 407
 Pogibshi Channel, 619, 620,
 626, 627-8
 Pogobi, Cape, 757, 761
 Pogrommoi and Volcano,
 670, 671
 Pointed Rock, 1133
 Pointer Island, 523
 Pointers Rocks, 524, 525,
 560
 Poison Cove, 532
 Poituk Rock, 982
 Polar Sea, 700-2
 Pole, Cape, 605
 Polia Point, 174
 Polland Island, 1112
 — Rock, 1112
 Polot Islands, 998
 Polovintchay Rock, 722
 Ponafidin Island, 846-7
 Ponapi Island, 972, 979—
 986
 Pond Island, 148
 Ponente Point, 53
 Popoff Island and Strait,
 667
 Popov Island, 770
 Porcada Island, 24
 Porcher Island, 539, 548,
 550, 558
 Porfia Point, 174
 Poromushir Island, 737
 Poronai, 870
 — River, 749
 Pororoga Island, 627
 Poro Tomari, 759
 Porpoise Islands, 621
 — Rock, 108
 — Rocks, 644
 — Strait, 1148
 Port Reef, 525
 Portage Bay, 617
 Portier Pass, 365, 385-6
 Portland, 269, 369-310

- Portland Canal, 561-8,
 595
 Inlet, 561
 Island, 374
 Point, 419, 562
 Portlock Harbour, 625-8
 Portsmouth Breakers, 813
 Portuguese Point, 305
 Posietto Bay, 767-9
 Pospaloff Point and Lights,
 771
 Possession, Point, 394, 654
 Sound, 334,
 342-3
 Postels, Cape, 713, 714
 Pot Rock, 451
 Potainikoff, Cape, 678
 Potoci Rocks, 103
 Poulo Bay, 660, 665
 Pouloukoi Island, 998
 Pouloupa Island, 979
 Poulousouk Island, 999
 Pouynipete Island, 979
 Povorotni, Cape, 729, 735
 Povorotny Island, 608
 Point, 773
 Powhattan Reef, 1143
 Pozo, El, 28
 Pozost Island, 998
 Prazeros Islands, 1037
 Preezy Harbour, 376, 378-9
 Preebrayenia Bay, 717, 773
 Prescott Island, 586-7
 Presidio Shoal, 245
 Prevost Harbour, 369
 Island, 368, 381,
 571, 572
 Passage, 374
 Peak, 739
 Price Island, 527, 540
 Point, 7
 Prideaux Point, 449
 Priest Rock, 672
 Priest's Rapids, 310
 Prieta Point, 155, 167, 168
 Prietos, Cerros, 174
 Primera Agua Point, 160
 Prince Island, 814
 Prince Ernest Sound, 600,
 603
 Frederick Sound,
 607-9
 George Island, 115
 of Wales Archipe-
 lago, 660, 698, 603, 605-
 606
 Cape,
 697-8
 Reach,
 487
 Prince William Sound, 591,
 642-8, 1179
 Princess Louisa Inlet, 487
 Princess Louise Rock, 441
 Princess Royal Islands,
 522, 532, 541, 568
 Princess Royal Reach, 487
 Princess Island, 965
 Principle Channel, 516
 Prinz Heinrich Harbour,
 1019
 Prisoner Harbour, 224
 Proche Island, 656
 Prokofeff Island, 745
 Promise Island, 534
 Point, 529
 Prongé, Cape, 765
 Prospect Island, 930
 Prosper, Farallon de, 23
 Promser Rock, 511
 Protection Island, 331, 414
 Port, 603
 Providence Cove, 393
 Islands, 969
 Islet, 1024
 Port, 715-16
 Reef, 1160,
 1161
 Providencia, Canon de, 153
 Prybilov Islands, 704-707
 Pueblo Nuevo, Port, 23-5
 Puerco Point, 18
 Pucrii Island, 21, 22
 Puertecitos, 143
 Puffin Islet, 354
 Puget, Cape, 616
 Puget Island, 308
 Sound, 279, 311,
 333, 338-340
 Pully, Point, 337
 Pulmo, Cape, 174
 Pulpito Point, 158
 Puna, 1073
 Cove, 1100
 Punch Bowl Hill, 1096
 Puncos, 1075
 Punta Arenas, and Light,
 3, 4, 32, 37, 38-40
 Punta Arenitas, 32
 Puntarenas, 38
 Punta-Sacate Island, 58
 Pucwina Hill, 1096
 Purgatorio, Canon de, 153
 Purissima, Boca de la, 186
 River and Point,
 227
 Purple Bluff, 526
 Pushashina Point, 762
 Pustareak, 744
 Putiatin Island, 772
 Puzzle Island, 414, 417
 Pybus, Point, 608
 Pyghella Islet, 999
 Pyke, Point, 646
 Pylades Channel, 387-8
 Pylstaart Island, 1123
 Pym Island, 373
 Pyramid Islet and Harbour,
 616
 Pyramid Rock, 156, 753,
 1135
 Qlawdzet Anchorage, 538
 Quadra, Boca de, 595
 Island, 319
 Qual-a-ute, 526
 Qual-a-waloo Bay, 268
 Quallcum River and Bay,
 475
 Quartermaster Harbour,
 338
 Quas-cillah Inlet, 517
 Quathinaky Cove, 495
 Quatsino Narrows, 450, 451
 Sound, 404, 415-
 452
 Queen Charlotte Channel,
 481-2
 Islands,
 277, 568-589
 Sound,
 322, 595-513
 Sound, 526
 Queen's Cove, 436
 Reach, 464, 487
 Quel-ak-sea-hx, 534
 Quelama River, 69
 Quemisto, 111
 Qué-ni-uti River, 318-19
 Quoqos Point and Islets, 36
 Quequets, 586
 Quetzaltenango, 80
 Quibito Island, 20
 Quibo Island, 19
 Quicksand Bay, 295
 Quickstep Shoal, 1008
 Quila, 122
 Quil-loy-ute River, 320
 Quimper Peninsula, 331
 Quinamas Bay, 562
 Quisiguina Volcano, 69
 Quitshak, River, 688
 Quoin Hill, 519, 753
 Point and Lighthouse,
 763
 Quoy Island, 1023
 Rabbit Island, 1035
 Raccoon Straits, 247
 Race Islands, Lighthouse,
 and Passage, 322, 325,
 395-6
 Race Narrows, 422
 Passage, 499, 504
 Point, 385
 Racehorse Shoal, 785
 Rachel Islands, 550, 558
 Radack Islands, 951
 Radokala Islands, 962
 Rafael Point, 423
 Raft Cove, 452
 Rage Reef, 528
 Ragged Island, 378, 413
 Islands, 488
 Point, 452
 Rai Islands, 964
 Raia Point, 18
 Raikoke Island, 735
 Rain Point, 529
 Rainier, 309
 Mount, 344
 Rainy Bay, 413
 Ratten Cliff, 870
 Raitnsika River, 759
 Rakovya Harbour and
 Bank, 731, 733

- Bay,
 Harbour,
 451
 446—
 Channel,
 Islands,
 Sound,
 487
 8-19
 Islands, 36
 8
 320
 331
 2
 69
 bthousc,
 2, 325,
 04
 558
 2
 13
 and
- Raleigh Rock, 1163
 Rakik Islands, 950, 951,
 961-8
 Rameay Island, 575
 Rameien Point, 562, 565
 Ranada Point, 157
 Ranai Island, 1090
 Rancheria Island, 20
 Ranger Islet, 562
 Rankin Point, 1154
 Rankine Islands, 573
 Raur Island, 1002
 Raper Bay, 221
 Rara Island, 1141
 — Islet, 606
 Raaboinik Bay, 772
 Rashaun Island, 738-9
 Raspberry Islands, 540
 Rat Island, 682
 — Islands, 669, 681-3
 Ratak Islands, 959, 951,
 952-961
 Ratmanoff Bay, 714
 — Cape, 751
 — Island, 698
 — Port, 713
 Rattler Rock, 553
 Rattlesnake Island, 213
 Raukoko Island, 738
 Raven Islands, 587-4
 Raza Island, 490, 1141
 — Island and Rock,
 151
 Raza, Punta, 112
 Razor Point, 367
 Road Island, 491-2
 Road de San Antonio, 160
 — de Loreto, 160
 —, Estero, 50, 58, 62
 —, Rio, 111
 Roajejo, Port, 3, 45, 50, 51-
 57, 1240, 1261, 1257
 Reaumur Peak, 1019
 Rebecca Spit, 491
 Rebuntairiboi Island, 739
 Reception Bay, 834
 Rehusasen, River, 1022
 Recodo Point, 96
 Recruit Island, 1163
 Red Bluff, 147, 268, 270
 — Cliffs, 855
 — Cone, 196
 — Island, 382
 — Point, 150, 166, 547
 — Rock, 193, 248
 — Sea, 129
 — Bluff Point, 142
 — Cliff Point, 533, 554,
 888
 — Islet Point, 381
 — Stripe Mountain, 445
 — Top Mountain, 575
 Redcliffe Island, 769
 Redding Rock, 272
 Redfern Island, 511
 Redfield Rocks, 843-4
 Redonda Island, 413, 489
 Redondo, Cape, 181, 182
 — Rock, 17
- Reed Island, 882
 — Rocks, 259-260, 1109
 Reef Island, 362, 566, 577
 — Islands, 1150, 1152
 — Islet, 407
 — Point, 199, 446, 450,
 490, 706
 Refuge Bay, 550, 557,
 558
 — Cove, 403, 424
 Refugio, Puerto, 148
 Refunairi Island, 755
 Regatta Reefs, 528
 Rehusa Channel, 181
 Reid Harbour, 369
 — Rock, 356
 Reindeer Island, 667
 Reineke Island, 770
 Remarkable Cone, 522
 Remedios, Los, 25
 — Point, 70, 73
 — Point and Bay,
 149
 Remolina, Punta, 58
 Rempstone Rocks, 526
 Rennell Sound, 586
 Resolution Cove, 431
 — Shoal, 654
 Resurrection Bay, 649
 Restoration Cove, 521
 — Point, 336-7
 Retalhuleu, 80
 Retehechnoi, 675
 Retechnoi Islet, 769
 Retroat, Point, 612, 614
 Retribution Rocks, 912
 Reverdy Johnson Moun-
 tains, 567
 Revilla Gigedo Channel,
 595-8
 Revilla-Gigedo Islands, 1030
 — 1032
 Rey, Islas del, 7, 9
 Reyes Islands, 970
 — Point, and Light-
 house, 250, 266
 Rhin, Port, 953-4
 Rica de Oro, 847
 — de Plata Island, 1124
 Ricason Island, 157
 Rich Island, 1019
 Richard Point, 564
 — Rock, 417
 Richards Island, 880
 Richardson Inlet, 576, 577
 — Point, 534
 — Rock, 226
 Richmond Rocks, 110
 Rickord Island, 770
 Rigné, Cape, 1018
 Riko Balshu Unala River,
 640
 Rikord, Cape, 741
 Rinnik, Cape, 751
 Rimski-Korsakoff Islands,
 962
 Rincon, Rio, 32
 Riou, Point, 638, 639
 Ripple Bank, 553
- Ripple Point, 498
 — Rock, 495, 496
 — Shoal, 499, 501
 Risiri Island, 755-6
 Ritchie Bay, 421-2
 Ritidian, Point, 1047
 Rivadeneira Shoal, 923-
 924
 Rivas Point, 109
 River Bight, 544
 Rivers Inlet, 517-518
 Robben Island, 752
 Robbers Island, 408, 413
 Robbers' Nob, 500
 Robertson Island, 1158, 1160
 Roberts Bank, 458, 459
 — Point, 335, 347
 — Point and Town,
 457, 458-9
 Robinett Rock, 888, 914
 Robinson Island, 503
 — Mount, 514
 Roble, Punta, 23
 Robson Island, 448
 Roche Harbour, 366, 371
 Roche Poncié Islands, 912-
 913
 Rock Island and Light-
 house, 826, 828, 833
 — Islet, 346
 — Point, 148
 Rock-fish Harbour, 577
 Rocky Bay, 357, 694
 — Eminence, 794
 — Pass, 424
 — Point, 196, 272, 472
 — Point and Bluff, 144
 Roderick Island, 531
 Rodgers, Cape, 868
 — Harbour, 701-2
 Rodney, Point, 695
 Roger Simpson Island, 945
 Rogue River and Reef, 281
 Roic, Mount, 981
 Roiven, Cape, 876
 Rojnoff, Cape, 685
 Rojo, Mar, 129
 Rokko saki and Lighthouse,
 871, 875, 876-7
 Rokuren Island and Light-
 house, 790-1
 Rollin, Cape, 739
 Rolling Roadstead, 435, 436
 Romanoff, Cape, 692
 Romanotake Volcano, 864
 Romanzoff, Cape, 690, 756,
 871
 — Islands, 958
 Romanzov Bay, 756
 Rombreg, Cape, 751
 Rong-tob Islands, 962
 Rong-chappalap Island, 962
 Rongerik Islands, 962
 Rono Kiti Harbour, 983-4
 Root Point, 501
 Roqueta Island, 98-9
 Rosa Island, 1141
 — Punta, 136
 Rosalia Point, 196

- Rosario Bay, 22, 23, 90-2,
 172, 198
 — Island, 339, 1139
 — Rio del, 120
 — Strait, 343, 345-6,
 351-5, 457
 Rossa, Punta, 93
 Rose Harbour, 673
 — Point and Spit, 582
 Rosedale Rock, 395
 Roshnoff, Cape, 685
 Ross Bay, 401
 — Fort, 262-3
 — Islands, 966
 — Mountain, 252
 Rota Island, 1039, 1047-9
 Rotcher Island, 941
 Rothsay, Point, 601
 Rough Bay, 605
 Roomiantsoff, Cape, 690
 Round Hill, 1089
 — Island, 314, 387, 416,
 450, 506, 688, 739
 — Point, 567
 — Ro k, 273, 789
 — Lumpv Rock, 657
 — Top Mountain, 149,
 150
 Rowan Island, 1141
 Rowe River, 399
 Royal Bay or Roads, 396
 Royalist Island, 1146
 — Islands, 994
 Rua Island, 996
 Ruba, 968
 Rubia Bay, 627
 Rubicon Point, 834
 Rudder Reef, 474
 Rudlin Bay, 402
 Rugged Islets, 420
 — Peak, 147
 — Point, 438
 Ruk Island, 994, 995
 Rule, Cape, 1031
 Rupert Arm, 446, 450
 — Fort, 506
 Rurick Strait, 671, 959
 Rurom pi, 871
 Russell, Cape, 453
 — Island, 374, 379
 Russian Point, 650, 651
 — Reef, 613
 — River, 248, 262
 Ryan Point, 552
 Ryghynin, Cape, 713
 Saanich Inlet, 572, 375
 Sabaru sima, 818
 Saba sima, 796
 Sabben Passage, 1017
 Sabine Channel, 473, 484-5
 — Islets, 1146
 Sable Island, 944
 Sable River, 1043
 Saboga Island and Channel,
 7, 8
 Sabusawa, 850
 Sacate Isleta, 35
 — Point, 43
 Sacate-grande Island, 58
 Sacatula Rio, 103
 Sachine Strait, 605
 Sacken, Mount, 775
 Sacramento and River, 205,
 249
 — Reef, 197
 Sacrifice Island & Bay, 66
 Saddle Hill, 317
 — Island, 1155
 — Mountain, 857
 Sado Island, 871, 872-3, 874
 Safe Entrance, 519
 Safety Cove, 519-520
 Sags, 907
 — sima, 596
 Sagami, Cape, 829
 — misaki and Light-
 house, 833, 839
 — Peninsula, 830
 — ura, 829
 Sagano saki, 787, 788
 Saghalin, Gulf of, 764
 — Island, 742, 748-
 755, 758-761
 — Ula, River, 765
 Saginaw Bay, 607
 — Channel, 612
 — Point, 613
 Sagitsu-no ura, 907, 908
 Saiduji gawa, 804
 Sango Harbour, 879
 Sail Rock, 149, 192, 236,
 416, 889
 — Rocks, 1131
 Sailor Point, 399
 Saimanov, Cape, 752
 Saino Island, 27, 28
 Saimson Island, 1020
 St. Abraham Island, 702
 — Albana, Point, 604
 — Andrew Islands, 1027
 — Anthony Peak, 741
 — Catharine Point, 764
 — Croix, Gulf of, 718
 — David Islands, 1024-5
 — Elena Bay, 43
 — Elias, Mount, 590, 638,
 639
 — Elmo, Bay of, 9
 — Eustaphia Bay, 774
 — George Bay, 275
 — Island, 113, 114,
 705-6
 — Point, and Reef,
 274
 — Rock, 657
 — Helen, 310
 — Helen's, Mount, 303, 312
 — Hermogenes, Cape, 660
 — James, Cape, 671, 588
 — John Harbour, 628
 — Point, 479, 481
 — Jona Island, 747
 — Lawrence Bay, 708-
 710, 714
 — Island, 702-3,
 1230
 — Lazara Island, 630
 St. Ismaro Peak, 128
 — Marcan Island, 682
 — Mary, Cape, 353
 — Point, 615
 — Matthew Island, 703-4
 — Michael Island, 692
 — Redoubt, 692-3,
 1181
 — Nicholas Bay, 748
 — Point, 761
 — Paul & Harbour, 656-9,
 1180
 — Island, 706-7, 1181
 — Peter Island, 846
 — Stephen Island, 665, 682,
 702
 — Thaddens, Cape, 710-
 720
 — Theodore Island, 702
 — Valentine Bay, 774
 — Vincent Channel, 800
 — Vladimir Bay, 775-6
 — Xavier Island, 1145
 Saipan Island, 1052-4
 Saito Reef, 814
 Sajouliuchtuzigh Island, 666
 Sakai River and Light, 807
 — yama hana, 895
 Sakaida, 800
 Sakata, 872
 Sakata Bay, 801
 — sima, 820
 Sakihana saki, 1150
 Sakura, 877
 Sakoshi Bay, 803
 Sakura Island, 784, 785
 Sal, Point, 227
 Salal Point, 530
 Salatea Marsh, 175
 Salem, 309
 Salicacia Island, 134
 Salina Cruz Bay and Point,
 86, 88
 Salina del Marques, 88
 Salinas Bay, 42, 43-4, 163
 — de Rosario, Morro
 de las, 90
 — Island, 44
 — Point, 165
 — Valley and River,
 230, 233, 234
 Salisbury, Point, 611
 Salmon Bank, 355
 — Bay, 499, 784
 — Cove, 564
 — Creek, 262
 — River, 331, 567
 — Bight, 553
 Saloupa, River, 1043
 Sal as-puedes, Cerro de, 32
 — Channel and
 Isla d, 161
 — Point, 34, 202
 Salop River, 317
 Salt Point, 263
 Saltchidak Island, 659
 Saltspring, 379
 — Bay, 580
 Salt-p ts Bay, 103

- Samala River, 80
 Samarag Island, 146
 — Isola, 231
 Same no a, 898
 Same nooda Bay, 672, 674
 Samish, 346
 Sami sima, 913
 Samos Reef, 1005
 Samuel Island, 368
 — Point, 613
 San Agueda, Canon de, 153
 — Alessandro Id., 1137
 — Andres, Hacienda, 121
 — Point, 48
 — Antonio, 169
 — Creek, 247
 — Point, 141, 197
 — Ant. rio, Rio, 234
 — Augustin, Cape, 193
 — Augustino Island, 989,
 1137
 — Balardo, Rio, 227
 — Bartolom, Cape, 605
 — Bartolomé Bay, 191
 — Island, 999
 — Bartolomeo Id., 1035,
 1036
 — Basilio Bay and Point,
 158
 — Benedicto Island, 1031
 — Benito, 80
 — Islands, 194
 — Bernardo Island, 226
 — Berto Island, 1031
 — Blas, 83, 85, 115—120
 1174, 1239, 1250
 — Bruno Creek, 159
 — Island, 169
 — Buenaventura, 205
 — Carlos, 190
 — Bay, 135, 164
 — Gulf of, 57
 — Island, 606
 — Point & Bay,
 162, 163
 — Puerto de, 141
 — Rio, 38
 — de la Union,
 58, 60
 — de Monterey,
 205
 — Christoval River, 115
 — Clement Island, 220-1
 — Cosme Point & Rock,
 163
 — Cristobal Bay, 190
 — Point, 179
 — Cristoval Mountains,
 673
 — Damien Rock, 163
 — Diego Bay and Light,
 205, 208-10, 238, 1175,
 1177
 — Island, 165
 — Dionisio Island, 1137
 — Domingo, Boca de, 186
 — Point, 167,
 187
 — Estevan Island, 142
- San Eugenio Point, 101-2
 — Evaristo Point, 164
 — Felipe, 12
 — Point, 147
 — Fermin Point, 147
 — Francisco Bar, 87
 — Bay, 163,
 198
 — Ensenada
 de, 139, 140
 — Harbour and
 Lights, 238—254, 1175,
 1176, 1237, 1240, 1243,
 1245, 1248, &c.
 — Island, 166,
 816
 — Mountains,
 238
 — de Berja, 148
 — Francisco Point &
 Bay, 151, 152
 — Gabriel Point, 152
 — River, 211
 — Geraldo, Rio, 227
 — Geronimo, 79
 — Island, 197
 — Gregorio River, 236
 — Hilario Island, 199
 — Hipolito Point and
 Bay, 189
 — Ignacio, 155
 — Bay and
 Point, 135
 — Island, 134,
 135
 — Lagoon and
 Mountain, 187-8
 — Point, 157
 — River, 143
 — de Agana,
 1045
 — Inez, Sierra, 217
 — Jacinto, Mount, 628
 — José, 3, 38
 — Bank, 7
 — Cape, 33, 35
 — Fort, 1043
 — Island, 7, 10
 — Islands, 27
 — Islet, 407
 — Point, 201, 244
 — Rio, 165, 175
 — de Guatemala,
 74, 75, 77-9, 1257
 — del Cabo Bay,
 175-6
 — do los Ures, 130
 — Josef Bay, 452
 — Island & Channel,
 165-6
 — Juan Island, 351, 355,
 370
 — Mountain, 115
 — Port, 324, 325,
 393
 — Rio, 19, 38, 45, 49
 — Rock, 18
 — Bautista Flats,
 141
- San Juan Bautista Point
 and Bay, 162
 — Capistrano, 211
 — del Sur, Port,
 45-7
 — Nepomucino Id.,
 169
 — Juanico Cove, 158
 — Point and
 Lagoon, 186
 — Juanito Island, 113
 — Lazaro Archipelago,
 569
 — Cape, 185
 — Leandro Bay, 247
 — Lino Bay, 158
 — Lorenzo Island, 152
 — Point, Channel,
 and Reef, 170-71
 — Port, 28, 58,
 277, 427
 — River, 132, 235
 — Rocks, 98
 — Lucas, Cape, and Bay,
 177-8, 1174, 1255
 — Lucas Cove, 154
 — Island, 39, 225
 — Luis, 80
 — Island, 147
 — Point, 227, 228
 — d'Apra, Port
 1044-5
 — Gonzales Bay,
 148
 — Obispo, 227-9
 — Rey, 210, 211
 — Marcal Point and
 Rock, 163-4
 — Marcos Island, 154,
 169
 — Marte Bay, 164
 — Martin, 49
 — Cape, 230
 — Island, 199-200
 — Mateo, 87
 — Bay, 409
 — Miguel, 2, 68, 65
 — Miguel, Bay of, 6
 — Cape, 152, 202
 — Island, 225-7
 — Port, 208
 — River, 63
 — Volcano, 3,
 55, 68
 — Nicolas Bay, 168
 — Island, 222-3
 — Pablo Bay and Point,
 190
 — Point, Bay, and
 Strait, 248
 — Pasquel Point, 163
 — Pedro Bay and Light-
 house, 212-14
 — Bay and Point,
 179-180
 — Boca, 29
 — Hill, 212
 — Island, 29, 109,
 1034

- San Pedro Point, 141, 157,
 227
 ———, Port de, 36
 ———, Martirialot, 142-
 143
 ———, Nolasco Island,
 141
 ———, Point,
 227
 ———, Pedro's Wife Rock,
 212
 ———, Quentin Bay and
 Cape, 198
 ———, Port, 198-9
 ———, Rafael, 248
 ———, Bay, 151
 ———, Island, 991
 ———, Ramon Bay, 200
 ———, Roque Island, 190
 ———, Point & Bay,
 190
 ———, Rio de, 299
 ———, Salvador, Coast of,
 1, 2, 3, 5, 64-5, 69-70
 ———, de Jiquilisco,
 Bay of, 66
 ———, Volcano, 48,
 69
 ———, Sebastian, Cape, 281
 ———, River, 262
 ———, Sierra de,
 132
 ———, Viscaino Bay,
 194-6
 ———, Numeon Bay, 229-230
 ———, Telmo Point, 164
 ———, Tomas Island, 846
 ———, Vicente, 65, 68, 201
 ———, Island, 137
 Sana, 741
 Sansai sima, 900
 Sanbon-take Rocks, 843-4
 Sancelito, and Point, 248
 Sand Island, 304, 305, 1122
 ———, Islands, 622
 Sandian, 748
 Sandfly Bay, 566
 Sandon Rocks, 1147
 Sandspit Point, 525, 541
 Sandstone Reef, 530
 Sandwich Islands, 1062-
 1106, 1169, 1190, 1193,
 1219, 1252, 1258, 1264,
 &c.
 Sanny Island, 477, 1168,
 1162
 ———, Point, 371
 Sanemova Point, 853
 Sangran sima, 552
 Sangar Strait, 854
 Sangster Island, 480, 484
 Sannem-sima, 801
 Sannagh Island, 668
 Sannak Island, 668
 Sannom Island, 588
 Sannoral Islands, 1027
 Sannum Narrows, 375-6
 Santo Agueda Point, 154
 ———, Ana, 12, 212
 Santa Ana Bay and Point,
 153
 ———, River & Lagoon,
 211
 ———, Antonita Point, 158
 ———, Barbara and Light-
 house, 216-17
 ———, Bay, 136
 ———, Channel and
 Islands, 207, 215-227
 ———, Island, 222
 ———, Catalina Island, 163,
 221-2
 ———, Mountain, 147
 ———, Clara Island, 1144
 ———, River, 114, 215
 ———, Volcano, 51
 ———, Cruz, 136
 ———, Bay, 93, 94, 168
 ———, Hacienda, 121
 ———, Harbour and
 Light, 234-5
 ———, Island, 165, 224,
 1045
 ———, Island and Point,
 29
 ———, Mountains, 237
 ———, Point, 172
 ———, Point and Light,
 232, 234
 ———, Elena, Cape, 43
 ———, Inez Point, Islands,
 and Bay, 151-5
 ———, Rio, 227
 ———, Lucia Bay, 99
 ———, Sierra de, 230
 ———, Magdalena Plains, 155
 ———, Margarita, Cape, 277
 ———, Island and
 Mount, 180-81
 ———, Maria Bay, 185
 ———, Cove and Moun-
 tain, 153
 ———, River, 7
 ———, de Abome, Rio,
 135
 ———, del Mar, 87
 ———, Marina Point, 181
 ———, Monica, 214
 ———, Rosa, 180
 ———, Bank, 1061
 ———, Island, 225, 1032
 ———, Shoal, 1042-3
 ———, Rosalia Bay, 196
 ———, Canon de, 153
 ———, River, 155
 ———, Terresa, Barra de, 96
 ———, Point, 162,
 158
 Sant' Angel, Fort, 1043
 Santiago Bay, 105
 ———, River, 23, 70, 120
 ———, de Ystapa, Morro
 de, 89
 Santo Domingo, 33
 ———, Monte, 980
 ———, Tomas and Point,
 178, 201
 ———, Tomas Island, 1030
 Sapporo, 864, 870
 Sappron Island, 1115
 Saracen Roofs, 889, 893
 Sarah Island, 531, 532
 ———, Point, 488, 489, 554
 ———, Anna Island, 928
 Saraki, Cape, 858
 Saranuaia Cove, 679
 Saratoga Spit, 532, 834, 879,
 840, 841
 Sarcophagus Island, 719
 Sardines, Bay of, 229
 Sares Head, 345
 Sargent Point, 143
 Sargento Point, 147
 Sariguan Island, 1055
 Sarpan Island, 1047
 Saru, 865
 Saruko sima, 802
 Sarn sima, 834-5
 Sarycheff Strait, 704
 Sarytscheff, Cape, 670
 ———, Peak, 738
 Sasado saki, 818
 Sasa jima, 799
 Satanna, Cape, 682
 Satano misaki, and Light-
 house, 784
 Satawal Island, 1000
 Satchet Head, 334
 Satellite Channel, 374
 ———, Pass, 408, 412
 ———, Reef, 471
 Sato saki, 813
 Sato ura, 911
 Saturna Island, 364, 367,
 458
 Saucelito and Point, 248
 Saunders Island, 1123
 Savannah River, 6, 7
 Savary Island, 488
 Saw Reef, 575
 Sawaki, 568
 Sawara, 864
 Sawa-umi Bay, 873
 Sawosaki, 892, 893
 Sawyer Bank, 53
 Sayama Mountains, 875
 Saypan Island, 1037, 1038,
 1039
 Scammon Lagoon, 195
 Seaborough Hill, 305, 312
 ———, Island, 948
 ———, Islands, 936,
 1127
 Schischmareff Inlet, 699
 ———, Point, 702
 ———, Strait, 939
 Schjetman Reef, 1034
 Schooner Cove, 419
 ———, Passage, 511, 527,
 549
 ———, Point, 541
 ———, Retreat, 519
 Schouten Islands, 1020,
 1022, 1024
 Schulze Cove, 627
 Schumagin Islands, 666-7
 Scotch Fir Point, 456, 487

Scott, Cape, Channel, and Islands, 463, 512-513
 — Island, 379
 Scottsburg, 288
 Scout Shoal, 170
 Scrooge Rocks, 397
 Scudder Point, 574, 575
 Seylla Rocks, 1035
 Sea Egg Rocks, 484
 — Lions Island, 689
 — Otter Bank, 642
 — Otter Cove, 452
 — Otter Island, 706
 — Otter Islets & Rocks, 514-515
 — Otter Rock, 420, 425
 — Otter Sound, 605
 Seabird Islet, 406
 Seabock and Island, 342
 Seaforth Channel, 522, 524, 528
 Seashore Islands, 700
 Seal Rock, 142, 172, 275, 327, 484
 — Rocks, 166, 242, 290, 480, 541, 557, 567, 643, 649
 Sealed Passage, 511
 Seattle, 336
 Sebastian Lobos or Lopez Island, 1125, 1127
 — Vicosino Bay, 194
 Seberakov Island, 769
 Secas Islands, 26
 Section Cove, 575
 Secretary Island, 385, 394
 Secure Anchorage, 519
 Security Bay, 607
 Sedmond River, 573
 Seduction Point, 615-16
 Seehilt Arm, 484, 487
 Segouan Island, 677
 Selomo, 347
 Seki nai no saki, 865
 Sekou Point, 327
 Seleno, 737
 Selape Island, 1003
 Selwyn Islet, 577
 Semenoff, Cape, 726
 Semiahmoo Bay, 347-8
 Semisopchutui Island, 681
 Semtsch Island, 669, 683
 Senbon Peninsula, 904
 Sendai, 781
 — Bay, 850-51
 Sendai kawa, 908-9
 Senda saki, 833
 Seniavine, Cape, 686, 752
 — Islands, 979-987
 — Strait of, 711-14
 Senora Island, 9
 Senorta Island, 9
 Sentinel Island, 369, 542
 — Islet, 548
 Sentinela Island, 21, 22
 Separation Point, 360, 375
 Sequelchin River, 284
 Sequelad de Petacaltepo Reef, 37
 Sequerra Isles, 970

North Pacific.

Serdas Kamen, Cape, 662, 708
 — Mountain, 718
 Sergeieff Isthmus, 679
 Sérieuse Shoal, 99
 Seripbos Rock, 1143
 Serpent Islands, 964
 — Point, 523
 — Rock, 789
 Sortunai, 759
 Sesga Point, 42
 Seshart and Channel, 415, 417
 Setei Island, 1153
 Seto-da jima, 799
 Seto Uchi, The, 779, 788—
 815, 1186
 Setuabal Island, 1000
 Seven Islands, 987
 — Rocks, 785
 Sévernaia Guba, 750
 Severny Islands, 704
 Sevilla, Isla, 29
 Seward Roads, 1118, 1119
 Sextant Point, 199
 Seymour Bay, 1158
 — Canal, 610
 — Inlet, 512
 — Mount, 580
 — Narrows, 494, 496
 Seypan Island, 1052
 Shadwell Passage, 507, 508-9
 Shag Rock, 10, 246, 416, 1155
 Shah Bay, 1154
 Shakoff, Point, 734
 Shakotan, Mount, 870
 Shaku-ahi Rock, 814, 892
 Shalers Island, 1108
 Shanghai, 1262, &c.
 Shanghai Islands, 572, 588
 Shantar Islands, 742, 747-8
 Shantarak Islands, 747
 Shantz Point, 776
 Shanz Islands, 963
 Share Bay, 867, 868
 Shark Pass, 412
 — Reef, 359
 — Reefs, 420, 425
 Sharon, 727
 Sharp Peak, 148, 152, 202, 553
 — Point, 419, 424, 470, 473
 Shasta, Mount, 249, 275-6
 Shattock Point, 555
 Shaulak Island, 983
 Shaw Island, 355, 361, 652
 Sheep Passage, 531
 Shell Islet, 506
 Shelter Arm, 424
 — Bay, 776
 — Cove, 266, 516
 — Island, 444, 612, 615
 — Islands, 418
 — Point, 480
 Shelvocks Island, 1108

Shemmi hana, 910
 Shendora Hill, 834
 Shen no she, 1151
 Shepherd, Mount, 480, 484, 485
 Sheshtoi Strait, 738
 Sheudi Hill, 1151
 She wan she, 909
 Shishakotan Island, 739
 Shibets, 867
 Shika no se, 804
 Shilka River, 765
 Shimidzu Harbour, 824
 Shimodusa sima, 821
 Shimomu sima, 891
 Shimo no Koshiki, 911
 Shimonosaki, 792
 Shimo Yamada, 852
 Shipagawa, 838
 Shinanogawa, 873
 Shingle Point, 439, 508
 — Spit, 479
 Shinnato, 875
 Ship Anchorage, 537
 — Channel, 418, 420, 425
 — Islet, 407
 — Passage, 410, 517
 — Point, 477
 — Rock, 147, 444, 675
 Shipunkoi, Cape, 728, 729
 Shiranai Bay, 857
 Shira she, 890
 Shirasu Reef and Light-house, 790
 Shirinky Island, 737
 Shiroy iwa, 797, 798
 Shiro iwa, 865
 Shiro-se, 892
 Shi-shaka Island, 799
 Shishaldin, Mount, 670
 Shishkoff Point, 871
 Shiuwonde yama, 800
 Shiwo saki, 811
 Shoal Bay, 359, 360
 — Channel, 482-3
 — Islands, 376
 — Point, 144, 399, 751
 Shoals Point, 630
 Shoalwater Bay, Cape, and Light-house, 312-15
 Sho-ran Bay, 271
 Sho ura, 897
 Shovel Island, 1108
 Sho yama, 897
 Shrub Islet, 547
 — Point, 544
 Shubrick Reef, 275
 Shumahu Island, 737
 Shurijo, 1151
 Shushartie Bay and Saddle, 507-8
 Shute Passage, 365, 373
 — Reef, 374
 Shuttle Island, 576
 Siachladak Island, 650
 Siamatsu, 847
 Siapanor Island, 992
 Siau Wuhu Bay, 773-4
 Sibi no saki, 869

- Sibotta aima, 866
 Sielata Point, 98
 Selmouth Islet, 1154
 Sidney Channel and Spit,
 365, 372
 Sido Bay, 802
 Sierte, Boca, 35
 Sigak, Cape, 675
 Siga aima, 882
 Signal Head and Lt.-house,
 899, 905
 Sigoum Island, 677
 Sihuantanejo, Port, 102
 Sikha River, 284
 Sikine aima, 843
 Sikok Island, 778, 787
 Sikolan Island, 741
 Silet Island, 995
 Silla Islands, 27
 Silva de Atuera Island, 24,
 25
 — de Tierra Island, 24,
 25
 Soma, Cape, 819—826
 Somabara Gulf and Light,
 782, 907
 Sunada aima, 810
 Sunagawa, 1146
 Suna kachi ura, 818
 Suna-no-chi, 875
 Sunesonoff Island, 667
 Sunidin Island, 665
 Sumida Harbour, 787
 Sumida, 851
 Sumeda Harbour, 776, 782,
 826-9
 Sumenamba Point, 796
 Sunesonoff Island, 661
 Sunosueki, 791, 792
 — Strait, 783, 789,
 791-5, 884
 Simpson, Fort, 555-6
 — Islands, 936
 — Port, 550, 554-6
 — Rock, 508
 — Shoal, 632
 Sunuor Island, 739
 Sunshoma River, 342
 Sinaloa, and Rio de, 81, 130,
 134, 135
 Sinclair Island, 346
 Singapore Rock, 856
 Single Islet, 444
 Singo, 817
 Simmororan, 864
 Sintalapa, Rio, 2
 Souchi Point, 626
 Siourkoum, Cape, 763
 Sirahama Bay, 867
 Sirakami, Cape, 861, 863,
 868
 Sirano River, 63
 Sirassi achi, 812
 Siru achi Inlet, 878
 Sirotoko, Cape, 753
 Sir Francis Drake Bay, 204,
 266
 Siriano River, 63
 Siribetsu Volcano, 863, 864
 Siriya achi and Lighthouse,
 863-4, 861
 Siro aima, 790, 901
 Sirotoko, Cape, 867
 Siro yama, 781, 831
 Siro-unku Bay, 870
 Sisiki Bay, 887
 — achi, 887
 Sister Islands, 621
 Sisters Islets, 354, 417, 480-
 481, 531
 — Peaks, 181
 — Rocks, 105, 273
 Siatro Point, 767
 Sitchunak Island, 659
 Sitka, 570, 590, 591, 593,
 632-4, 1178, 1180
 — Archipelago, 697, 618
 — 634
 — Sound, 628—634
 Sitkhin Island, 680
 Sitawura Bay, 906
 Siyoutchy Rock, 685
 Siwash Channel, 620, 622
 Siwakubi, Cape, 857
 Siwo misaki and Lt.-house,
 814-15, 832
 Six Islands, 948
 Sixty-four Fathoms Bank,
 1124
 Snyako aima, 800, 801
 Siza Rock, 473
 Sioakuta, Cape, 791, 794
 Skast Harbour, 574-5
 Skedana Bay and Islands,
 578
 Skeena River, 456, 539—540
 Skidegate Inlet & Channel,
 570, 571, 579—581, 596-7
 Skena River, 456, 539
 Skimettle Inlet, 573-4
 Skippack Island, 358
 Skiton, 587-8
 Skotan Island, 741, 866
 Skrubin Bank, 770
 Skrypleff Island & Lights,
 771
 Skuduts, Cape, and Light-
 house, 870
 Skywhamish River, 342
 Slab Point, 567
 Slate Islet, 535
 — Chuck Brook, 580
 Slavianska Bight, 716
 — River, 262
 Slavianski Bay, 7-9
 Sledge Island, 695
 Simpson Reef, 500
 Slingsby Channel, 611-12
 Slip Point, 327
 Small Islands, 627
 Smith Inlet, 517
 — Island, 149, 540,
 845-6, 908
 — Island and Light-
 house, 344, 362
 — Point, 305
 — River, 275
 — Sound, 616
 Smoky Bay, 660
 Smota ura, 812
 Smyth, Cape, 700
 — Islands, or Islets,
 952, 961, 1034-5
 Snarres Islands, 738
 Snettisham, Port, 610
 Snug Basin, 409
 — Cove, 482
 — Creek, 375
 — Corner Bay, 645
 Soconusco, 75, 86-7
 Socorro Island, 1030, 1031
 —, Puerto del, 316
 Soimonoff, Cape, 762
 Sakkota, 769
 Solander Island, 443
 Sololad, Boca de, 186
 — Canon de, 153
 — Rocks, 201
 — Valley, 231
 Solentiname Island, 49
 Soleny Island, 679
 Solitarios Island, 201
 Sombrero Peak, 197
 —, Punta del, 32
 Sombrenito Point, 155
 — Rock, 156
 Sombrio River, 393
 Somerville Island, 562
 Sonate Island, 49
 Sonora, 123, 130, 135, 137
 Sonsonate and Roads, 3, 65,
 70-4
 Sonza ura, 897
 Sooke Bay and Inlet, 394
 Soonghe Island, 999
 Sophia Islets, 501
 —, Point, 621
 Sophy Islet, 565
 Sorol Islands, 1004
 Sorrow Island, 518, 524
 Sosagota Bay, 855
 Sosanjaya, 1048
 Sosanago, 1048
 Sosan Hagon, 1048
 — Haya, 1048
 Sotoan Islands, 991, 992-3
 Sotokana no she, 1151
 Sotomichiro Rock, 809, 905
 Soto-taka achi, 1118
 Souchoi Channel, 609
 Souchoi Inlet, 626
 Soulima, River, 686
 Soumaya, 1045
 Sound Point and Rock, 528
 South Bay, 193
 — Bay and Island, 579
 — Cove, 578
 — Island, 553, 845, 994,
 995, 1128, 1136
 — Passage, 516, 533
 — Reef, 423
 — Rock, 511
 — Rocks, 545
 Southampton Rock, 827
 — Shoal, 248
 South-East Arm, 449
 Southey Point, 355

INDEX.

1307

South Farallon Island and
Lighthouse, 259, 267-8,
1252
Southgate River, 494
South Rowan Island, 1141
South-West Rock, 1151
Southworth, Point, 337
Souvoroff and Cape, 687
Souvoroff Islands, 960
Soya, Cape, 755, 756, 780,
863, 867, 871
Sosa sima, 801-2
Spanberg, Cape, 699, 717,
867
— Island, 763, 741
Spanish Bank, 465
— Islands, 1061
Sparrowhawk Breakers, 512
— Rock, 553
Spartan Island, 988
Spakahi Harbour, 621
Speake's Rock, 499
Speck Reef, 57
Spencer, Cape, 591, 624, 635
— Keys, 1007
— Ledge, 402
— Point, 696
Spex Strait, 887, 888-9, 914
Sphinx Island, 383
Spicer Island, 549
Spider Island, 526
Spieden Island and Channel,
357, 369-379
Spirken Island, 674
Spit Point, 566, 578, 579
Spray Point, 542
Spring Passage, 357
Sprat Bay, 408, 412
Sprat Island, 615
— Point, 616
Spar Rock, 518
Squall Point, 547
Squally Channel, 543
Square Rock, 1132, 1133
— Point, 879-880
Squawmish River, 481, 482
Squim Bay, 330
Squirrel Cove, 489
— Settlement, 667
Sredni, Cape, 773
Srednoy Islet, 739
Staten Island, 740
Stachine, River, 602
Stachinski Strait, 603
Stag Bay, 488-9
— Rock, 547
Stamp Harbour, 410
Stanhope, Point, 602
Stanforth, Point, 533
Stanish Point, 731, 732
Stanley River, 584
Stapleton Island, 1133, 1134
Star Rock, 275
Starbuck Island, 335
Starfish Islands & Ledge, 525
Starichkov Reef, 679
Starlight Rocks, 418
Start Point, 562
Station Peak, 196

Steamer Bay, 603
— Cove, 424
— Passage, 410, 523,
562
Stearns Bluff, 317
Steep Cape, 658
— Island, 495
— Point, 362, 517, 541,
545
Steep-to Island, 959
Steilacoom, 339
Stenhouse Shoal, 558
Stephen Islands, 1022
— Rock, 547
Stephens, Cape, 692
— Island, 556-7
— Mount, 502-3
— Passage, 484, 607,
609-612
— Port, 546
Sterile Island, 656
Stevens, Fort, 300
Stewart Bay, 418-19
— Narrows, 535
— Port, 597, 770
Stikine, Fort, 601
— River, 456, 591, 602
Stillwater Anchorage, 613
Stobual Island, 957
Stockade Point and Bay, 364
Stockdale Harbour, 648
Stolbovoi, Cape, 727
Stolbovskaya, River, 727
Stoletté, Cape, 715
Stone Mole, 695
Stopford Point, 566
Stopper Islands, 417
Storm Islands, 511
— Islet, 546
Stetz sima, 803
Stoukambise Point, 759
Stragglers Islands, 451
Strawberry Bay & Islet, 345
Strawn Island, 931
Strook Bay, 779
Stripe Mountain, 531
Striped Peak, 325
Strogonoff Bay, 870
— Cape, 686
Strong Island, 975
— Tide Islet, 403
Stuart Anchorage, 537
— Channel, 365, 376-9
— Island, 357, 358,
366, 369, 493, 692
Stubbs Island, 419
Stumaun Bay, 554
Sturgeon Bank and Light-
house, 458, 459, 462
Styelman, Point, 610-11
Suchiltepeques, 80
Sucha Island and Harbour,
354, 358, 366
Sudio, Rio, 33
Suckling, Cape, 640-41
Sudo Island, 1153
Suda sima, 895
Suemez Island, 606
Suffren Bay and Cape, 761

Sugar-loaf Cape and
Mountain, 703
— Hill, 524
— Island, 748,
1154
— Rock, 202,
267, 657, 861, 1133, 1135
Suga sima & Lho., 820-21
Sui-fun River, 770
Suisun Bay, 249
Sak Island, 999
Sukune sima, 799
Sullivan Reefs, 442
Sullivan Island, 615
— Point, 607
Sulphur Bay, 1032
— Island, 1137, 1149
— Islands, 1136
— Rock, 191
— Rocks, 15
Sumass River, 410
Sumaye, 1045
Sumida gawa, 838, 839
Summer Bay, 672
Sunday Rock, 426
Sunderland Channel, 499
Su ne go, Cape, 868
Sung-ami Rock, 812
Sungari, River, 765
Sunharon, 1049, 1051
Sunken Rock, 511
Su-no saki, 829, 831
Superior Lagoon, 86
Superstition Point, 526
Supply Rock, 827
Suquamish Harbour, 341
Sur, Point, 239
Sura saki, 786
Sura take, 909
Surf Islands, 447, 543
— Point, 519
— and Rock, 528
Surge Islets, 444
— Narrows, 542, 627
Surprise Harbour, 608
— Patch, 517
Suruga, Gulf of, 823-5, 1185
Susaki, 827, 828
— Harbour, 787
— Islet, Cape, 764
Susinotsu, 908
Susa-Maria Lagoon, 188
Susami Anchorage, 514
Susan Island, 531
— Port, 342
Susanne Reef, 998
Susari Bluff, 827
Sutchan River, 773
Sutchoff, Cape, 764
Sutil Channel, 490-92
Sutlej Channel, 503
Sutsini, 863, 865
Sutsuki, Cape, 369
Sutt Bay, 889
Suwanee Rock, 599
— Rocks, 171
Suwa sima, 1145
Suwo Nada, 788, 795-6
Suzume Rock, 901

INDEX.

Sreno yama, 841
 Svetchnikoff Harbour, 678
 Swain, Cape, 526-7, 528
 — Reef, 882, 914
 Swale Rock, 415
 Swallow Island, 553
 Swamp Point, 567
 Swans, Bay of, 748
 Swanson Bay, 533
 — Channel, 364, 379,

382
 — Harbour, 621
 — Island, 591
 Swede Islands, 1000-1
 Swindle Island, 532
 Swinger Rock, 902
 Swiss Bay Island, 413
 Sybilla Island, 1035
 Sybille Bay, 776
 — Head, 762
 Sydenham Island, 943
 Sydney Inlet, 424
 — Islets, 487
 Sykes, Point, 598, 596
 Sylvia Rock, 888
 Symonds Bay, 630
 Symplegades, The, 912

Ta Island, 987, 993
 Taba sima, 796
 Tabiyo saki, 1149
 Table Bluff, 279
 Table Hill, 646, 556, 559, 1152
 — Island, 440, 516
 — Mountain, 202, 255
 — Point, 538
 — Rock, 320
 Taboga Island, 16
 — Rock, 16
 Taboguilla Island, 16
 Tabor Isle, 17
 Tabu sima, 871, 872
 Taco and River, 611
 Tacoma, Port, 338
 Tadeisi, Cape, 861
 Tadotso, 800
 Tagai Islands, 960
 Tagak Island, 987
 Tagh-Kiniagh Island, 666
 Tagleokou Mountain, 712
 Tago Bay, 823, 825
 Tagoilap Island, 1003
 Tagus, Point, 1047
 Tahaurawe Island, 1090
 Tahcen River, 617
 Tahiti, 1252, 1258, 1264, &c.
 Tahocora Island, 1106
 Tahoorowa Island, 1090
 Tah-sia Narrows and Canal,
 430, 434, 436
 Tah-siah Arm, 439
 Taigonca, Cape, 744
 Taio saki, 819
 Taipington Point, 1048
 Tai-pin san Islands, 1157,
 1159, 1160-1, 1162
 Taira jima, 911
 Tai sima, 821

Taize ura, 817
 Tajumulco Volcano, 77
 Taka Islands, 950, 952, 960-
 961
 Takabo Hill, 890
 Takatoko Island, 901
 Taka hama Rock, 908
 Takakami sima, 800
 Takain Islet, 981, 982
 Taka iso, 805
 Takamatsu, 801
 Taka mo saki, 822
 Takami sima, 800
 Takamaba Island, 788
 Taka no saki, 856
 Takasaki, 837
 Taka sima, 802, 812, 866,
 883, 885, 889, 898, 912
 — and Light, 884 5
 — (Coal), 899 900
 — Cape, 870
 Takaska yama, 848
 Takay Island, 978
 Taka yama, 872, 879
 Take saki, 793
 Take sima, 783, 1143
 Takhoen River, 616
 Takhenitch Creek, 290
 Takigawara seto and ura,
 893

Taking Island, 1155
 Tako Arm, 611
 Takou and River, 611
 Takura saki, 809, 811
 Takush Harbour, 517
 Tala Point, 340
 Talawa, Lake, 275
 Talon Island, 21, 22
 Tal-un-kwan Island, 577
 Tama gawa, 878
 Taman Island, 982
 Tamana Island, 939, 941
 Tama no ura, 896-7
 Tamarinda, 48-9
 — Bay, 108, 109

Tamary Aniwa, 754
 Tamatam Islands, 997-8
 Tambaliche Roads, 164
 Tameitai Bay, 906
 Tameca Reef, 998
 Tamiya Bay, 870
 Tammatapappa Island, 1105
 Tanabé Bay and Cape, 813-
 814
 Tanaga Island, 681
 Tanane, 617
 Tanapag Harbour, 1053
 Tanaga sima, 783, 1142
 Tanga sima, 803
 Tanghinakh Islet, 675
 Tang Kotan Bay, 759
 Tangle Cove, 574
 Tangolatangola Island and
 Bay, 92-3
 Tanji sima, 591
 Tannadagh Island, 682
 Tanner's Hill, 171
 Tanne ura seto, 894
 Tano Bank, 792, 793, 794

Tano Isle, 676
 Tan-oo Island, 576, 577
 Taongi Island, 952, 961
 Tapak Island, 982
 Tapimoor Pass, 954
 Taputeoua Island, 937,
 941-3
 Tar Islands, 576
 Tarafoto, Port, and River,
 1045, 1047
 Tarakai, 748
 Tarara Islet, 1159, 1160
 Tarawa Island, 937, 947-8
 Tarcoles Bay, 37, 40
 Tareinaki Harbour, 731, 734
 Taritari Island, 949
 Taroko, 866
 Taromai Volcano, 864
 Tartanno, 585
 Tartar Shoals, 96
 Tartary, Coast of, 767-776
 — Gulf of, 757-
 767, 1183, 1213
 — Strait, 757, 761,
 765
 Taruri Island, 871
 Tasiro sima, 851
 Taskara ura, 819
 Tasko Harbour, 888
 Tasman Bay, 786
 Tasoo Harbour, 589
 Tastiota, Estero, 141
 Tatai sima, 855
 Tatara sima, 894
 Tatchi, 886
 Tatchik Bay, 694
 Tatchi yama, 882
 Tat-chu Point, 437
 Tateishi no hana and
 Lighthouse, 878
 Tateyama Bay, 831-2
 Tainall Reefs, 510
 Tatouch Island and Light-
 house, 325, 326
 Tatsu maru, 911
 Tateume no hana, 784
 Tateupi saki, 855-6
 Tatte so, 910
 Tavalu, Boca, 132
 Tavano, Port, 740
 Tavasora, Rio, 23
 Tawo Bay, 895-6
 Ta Wuhu Bay, 774
 Tchagran Bay, 689
 Tchaitchi Islands, 677
 Tchaplun, Cape, 714
 Tchastie Islands, 680
 Tcheniya Bay, 773
 Tcherkasky Island, 767,
 768
 Tchetchekolnoum, 714
 Tchiaroun, 711
 Tching-an, Cape, 716
 Tchinkitany Bay, 629
 Tchirikoff, Cape, 717
 Tchougoul Island, 676
 Tchoukotak i, Cape, 714
 Tchugata Islands, 649
 Tchurkhoda Rock, 768

INDEX.

- Teacapan, Hacienda, 121
 Teaser Rock, 899
 Tebakah, Cape, 765
 Tebenkoff Cove, 692-3
 Tebut Island, 965
 Teapan, Booa, 120
 Te-cheh-quut, 284
 Tecojate, 80
 Tecusan Point, 112
 Tecchoote Peninsula, 314
 Tehuantepec, 88
 —, Gulf of, 5, 80,
 85-96, 1172, 1174
 Tejupan Bluff and Pape,
 103-4, 118
 Te-ka River, 584
 Tekalet, 341
 Tekkwas Bay, 518
 Telanski, Cape, 744
 Telegraph Harbour, 376,
 378
 — Hill, 345
 — Passage, 540
 Telica Volcano, 51
 Temo Island, 959
 TEMPERATURE of the Ocean,
 1231-2
 Tempisque, Rio, 38
 Templar Channel, 419
 — Rocks, 401
 Temporal, 4
 Tempusan Fort and Light,
 806
 Tenacatita Bay and Head,
 108-9
 Tenakee Channel, 622
 Tenelios Island and Mount,
 982, 983
 Ten-fathom Hole, 1132,
 1133
 Ten-foot Rock, 800
 Teno Rock, 890
 Ten-mile River, 265
 Tenela, Barra de, 86
 Tent Island, 377
 Tepic, 117
 Tepoca, Cape, and Bay,
 143
 Tepopa, Cape, 143
 Tequepa, Point, 102
 Teupa Islet, 16
 Tera sima, 891
 Termination Island, 772
 Ternei Bay, 776
 Terror Point and Rocks,
 547
 Teshiu River, 871
 Tesiko, Cape, 740-41
 Tesima, 801
 Tosan Shoal, 183
 Tot Island, 1017
 Totas de Cabra Peaks, 138-9,
 141
 Totoga yama, 894
 Touchi ura, 911
 Teumah Islet, 941
 Tourin gawa, 822
 Texhada Island, 473, 480,
 481, 484, 485
 Thames Shoal, 402
 Thatcher Passage, 361
 Thetis Cottage, 397
 — Cove, 398, 588
 — Island, 376
 Thirteen Islands, 1001
 Thom Point, 535
 Thomas Point, 505, 506
 Thompson, Cape, 699
 — Point, 362
 — River, 454, 460
 — Sound, 502
 Thormanby Islands, 484,
 485
 Thorn Rock, 588
 Thornborough Channel, 463
 Thrasher Rock, 388, 468
 Three Islands, 1127, 1138
 Three Hills Island, 623,
 846
 Three Sisters Islets, 1023
 Thumb Peak, 11, 559
 Thunder Bay, 487
 Thurlow Head, 190
 Thurlow Island, 497, 498
 Tiara, Mount, 749, 751
 Ti-a-usu Island, 1162,
 1163
 Tiburon Island, 141-2
 Tichenor Rock, 282
 Tichmenev, 752
 Tide Islet, 490
 Tide Rip Islands, 542
 TIDES, 1219-1228
 General Remarks, 1219 :
 Rey. W. Whewell on
 the Tides of the Pacific,
 1219-1224, on the Tides
 of the Central Pacific,
 1224; Tide Tables,
 1225-1228
 Active Pass, 382
 Akashi Strait, 805
 Amur, Gulf of, 766-
 767
 Aogaseto, 799
 British Columbia, 532,
 535, 542, 561
 California, Gulf of, 131
 Cocos Island, 925
 Columbia River, 307-8
 Discovery Passage, 494
 Finlayson Channel, 632
 Fraser River, 462
 Georgia, Strait of, 458,
 473
 Gilbert Archipelago, 929
 Golotas Channel, 507
 Guaymas, 138
 Hakodate, 860
 Haro Strait, 367
 Helen Reef, 1026
 Hiogo, 808
 Hirado no seto, 889
 Honolulu, 1099
 Inland Sea, 789
 Johnstone Strait, 498
 Juan de Fuca Strait,
 322-3
 TIDES—continued.
 Kiusiu, S.W. Coast, 910
 Kuruma no seto, 799
 Kurusima no seto, 798
 La Pérouse Strait, 767
 Laredo Sound, 542
 Mekari seto, 799
 Milbank Sound, 527
 Nagasaki, 905
 Nanaimo, 472-3
 Naruto Passage, 810
 Niegata, 875
 Nootka Sound, 429
 Osaka, 808
 Panama, 14, 15
 Portland Canal, 668
 Queen Charlotte Islands,
 588-9
 Rosario Strait, 354
 San Francisco Harbour,
 249-250
 Sandwich Islands, 1069,
 1219
 Seto Uchi, 789
 Seymour Narrows, 496
 Simonseski Strait, 792
 Spex Strait, 889
 Trincomalee Channel,
 386
 Teugar Strait, 855
 Uragi Channel, 841
 Vancouver Island, 404,
 405
 Yokohama, 838
 Tie Islet, 517
 Tierra Firme Point, 159-
 Tigalda Island, 671
 Tigalga Island, 671
 Tigel, River, and Fort, 743,
 744
 Tiger Island, 1017
 Tigil, 719
 Tigilsk, 743
 Tigro Island, 58, 59, 62
 —, Rio del, 33
 Tigrilo, Punta del, 32
 Tilapa, Rio, 2, 75, 80
 Tilema Lagoon, 86
 Tillamook Bay, 294-5
 — Head, Rock, and
 Lighthouse, 296-7
 Timber Cove, 263
 Tinaja Point, 157
 Tinaja Point and Mountain,
 179
 Tindal and Watts Islands,
 960
 Tinginak Island, 674
 Timan Island, 1037, 1039,
 1049-1052
 Tinto, Arroyo, 25
 Tintoreria Point, 162
 Tipitapa River, 50
 Tirado Banks, 1044
 Tshia Rock, 754
 Titiguapa, Rio, 67
 Ti-tul Islet, 577
 Tian Island, 957
 Ti-ell River, 581

- Tlevack Strait, 608
 Tlupana Arm, 428, 431
 Tonggi Islands, 1034
 Toase Island, 1000
 Toba Bay, 820
 —, Braso de, 490
 —, sima, 821
 Tobi Island, 1026
 —, sima, 810, 899
 Tobootchi Bay, 754
 Todd Rock, 402, 408
 Toelas los Santos Island, 846
 —, Santos Bay, 227
 —, —, Bay and Ids., 201-2
 —, —, River, 178, 180
 Toaigh Bay, 1078
 Toe-yah-yah Bay, 1078
 Tofino Inlet, 423
 Toqashira sima, 818
 Toi no misaki, 786
 Tokara sima, 1146
 Tokarefsky, Cape, Spit, and Lighthouse, 770
 Toka shika sima, 1165, 1166
 Toke Point and Lighthouse, 312
 Tokwa san Peak, 819
 Tokio, 780, 834, 837, 838-9
 Tokoea Island, 963
 Tokoro, 868
 Tok sima and Rocks, 1149
 Toku sima, 811
 Tol Island, 994
 Toledo, Cape, 285
 Tolmie Channel and Rock, 632
 Tolcolme Peak, 980
 Tolstoi, Cape, 679
 Tolstoy, Cape, 659
 Tom Islet, 636
 Tomales Point and Bay, 248, 260
 Tomangai sima and Light-house, 808, 809
 Tomari, 741
 Tomari ura, 909-10, 1151
 Tomas Bay, 43
 Toma so, 896
 Tomates, Boca de, 111
 Tombstone Bay, 566
 Tomgas Harbour, 699
 Tomie minato, 895-6
 Tomil Bay, 1006-7
 Tomoka Harbour, 907-8
 Tomio saki, 817, 834
 Tomo, 797
 Tomomai, 871
 Tonala Bar, 86, 87
 Tonduatek, 616
 Tone gawa, 849-850
 —, Point, 839
 Tongas Island, and Fort, 860-1, 593, 595
 —, Narrows, 598
 —, Passage, 562, 565
 Tongue Point and Channel, 309, 306-7
 Tonock Bay, 605
 Tono saki, 892
 Tonin, Cape, 753
 Tenkin Point, 547
 Tonkoy, Cape, 669
 Too-dai Rock, 882
 Too-too-totna River, 281
 Too-witl, 530
 Topase Harbour, 499
 Top-knot Point, 452
 Topoca, Cape, 143
 Topolobampo Harbour, 135
 Toporkoff Islet, 722
 Toporkowa Island, 658
 Toquart Harbour, 416, 417
 Tordillo, Cerro, 138
 Tordilo, Rio, 67
 Tori sima, 897-8
 Toriwi saki, 856
 Torres, Farallon de, 1055-6
 —, Island, 994
 —, Rocks, 1056
 Tortolo, Cape, 191
 Tortolos, Rio de los, 271, 272
 Tortuga Island, 154
 —, Rock, 122
 Torua Island, 957
 To saki, 786, 810
 Toaso, Cape, 181
 To sima, 843
 Tosimicots, Cape, 741
 Totomosiari Island, 756
 Totten Inlet, 339
 Toubout Bay, 759
 Touching Island, 949
 Touguéne, Point, 1043
 Toukara sima, 1146
 Touliskoi & Volcano, 675
 Toutounia River, 281
 Tow Hill, 582
 Towaihai Bay, 1078
 Townsend, Point, 608
 Townshend, Port, 331-2
 Tow-us-tas-in, 583
 Toyama Bay and Light-house, 875-6
 Toyo, 792
 Toyoma Point, 850
 Toyo sima, 800
 Trade Islet, 546
 Trading Bay, 663
 Trail Bay and Islets, 484
 Traitor's Cove, 697
 Traitors, Bay of, 741
 —, Islands, 1023
 Tranquil Creek, 423
 Transfiguration Bay, 717
 Trap Bluff, 440
 —, Rocks, 546
 Trapiche Peninsula, 9
 Traversay Islands, 957
 Treadwell Bay, 612
 Treaty Point and Light-vessel, 836, 840
 Treaty Ports—Japan, 779
 Tree Bluff, 562
 —, Island, 387, 1127
 —, Islets, 611
 —, Point, 565, 808
 Tree Rock, 901
 Tree-nob Islands & Rocks, 667
 Tree Saddle Hill, 829, 840
 Trefuse Point, 662
 Tremblores, Bahía de los, 211
 Trometon, Mount, 484
 Tres Columnas Island, 1125
 —, Marias Islands, 112-14, 117
 —, Marietas Islands, 111
 —, Virgenes Mountains, 153
 Trovan Rock, 572
 Trial Islands, 397, 401
 Triangle Island, 513
 Tribune Bay, 476, 479
 Trineomalie Channel, 365, 383-4
 Trinidad Bay, 267, 271-2, 277
 —, Boca, 174
 —, Head and Light-house, 271
 —, Island, 137, 138
 —, Point, 152
 —, River, 10
 Trin ty, Cape, & Isles, 659
 Trio Rocks, 1144
 Triple Islet, 803
 Tri-eta, Baxo, 989
 Triunfo de los Libres, Port del, 66
 —, Silver Mines, 129, 169
 Troilem Island, 1065
 Trollope, Point, 596
 —, Rock, 7
 Tromelin Island, 1004
 Trouble Island, 614
 Trucha Island, 21, 22
 Truk Islands, 993-5
 Truro Island, 562
 Trussett Patch, 567
 Tschatchanobury Peak, 741
 Tschegoula Island, 676
 —, Isles, 682
 Tschiganok Isle, 676
 Tschikotan Island, 736, 741
 Tschipanski, Cape, 725
 Tschirikoff Island, 665
 Tschitschagoff Bay, 683
 —, Cape, 687
 —, Islands, 958
 Tschoka, 748
 Tschougatschouk Bay, 651
 Tschirinkotan Island, 738
 Taikugo gawa, 907
 Taikoco River, 290
 Taimepan Peninsula, 551-6
 Tairing sima, 785
 Tais Islet, 994
 Taisia Rock, 754
 Taika, Cape, 860, 862
 Taivoko Island, 770
 Takagen Bay, 714
 Takahara Bay, 812
 Takuyo no se, 805

INDEX.

1311

Tsoo-skalti, 583
 Tsuba saki, 887, 888
 Tsubashi hana, 895
 Tsubo gashi Rock, 893
 Tsubura daki, 911
 Tuda Bay, 892
 Tsugar, Cape, 855
 ——— Strait, 779, 854—
 862, 1187, 1213, 1245,
 1264
 Tsuguru Strait, 854
 Tsuji sima, 907
 Tsukara so, 912
 Tsuki Point, 860
 Tsukiji, 838
 ——— Channel and Light,
 839
 Tsunigi saki, 827
 Tsu no sima and Light-
 house, 880
 Tsurua, 892
 Tsuruga Bay and Light-
 house, 807, 877-8
 Tsurugi saki and Light-
 house, 833
 Tsuruha saki, 909
 Tsuru sima & Lighthouse,
 796
 Tsusiet Waterfall, 406
 Tsu sima, 797
 Tsu-sima and Sound, 780,
 916-916
 Tutaru sima, 895
 Tasya sima, 816
 Tubootch Harbour, 1153
 Tucker Bay, 484, 485
 ——— Island, 1000
 Tugidak Island, 659
 Tugulu Island, 978
 Tugur, River, 748
 Tuguruk Bay and River,
 783
 Tugwell Island, 551
 Tuieni Island, 752
 Tujugak, River, 688
 Tulakip, 342
 Tule Estero, 134
 Tulle Island, 761, 762
 Tumai Head, 1151
 Tumoo Island, 468
 Tumen River, 767
 Tuman, Point, and Bay,
 1046
 Tumwater River, 340
 Tunashoe Island, 1156
 Tunitas River, 236
 Tura Island, 407
 ——— Island, and Rock, 356
 ——— Point, 369, 409
 Turnagain Island, & Arm,
 654
 Turnbull Reef, 373
 Turner Island, 142
 ——— Point, 636
 Turret Island, 612
 Rock, 1075
 Turtle Bay, 191
 Island, 535
 ——— Back Hills, 862

Turtles Rocks, 272
 Tsu sima, 1156
 Tusubre River, 36
 Tutomi Gulf, 823
 Tuyra River, 6, 7
 Twenty-foot Rock, 445
 Twilight Point, 523
 Twins Island, 632
 ——— Islands, 383, 421, 489
 ——— Islets, 549
 ——— Mountains, 574
 ——— Rock, 657
 Two Brothers Reef, 1112
 Two-headed Point, 659
 Two-tree Island, 944
 Ty, River, 749
 Tyahatooa Bay, 1080
 Tyk, Cape, 761
 Tymy River, 749, 751
 Ty-ping-san Islands, 1160
 Typso, River, 317
 Tyrol Point, 768
 Tyra Inlet, 617
 Tzaritza Rock, 632
 Tzartooa Island, 408
 Tzee Islands, 1150
 Tzimetiev Bay, 759
 Uakkoun, Cape, 716
 Ualan Island, 976-7
 Uandhi, Cape, 761
 Uap Island, 1005
 Uba sima, 830
 Ubita Point, 35
 Uchi no umi, 801
 Uchi umi, 811
 Uchucklesit Harbour, 409
 Ucluelot Arm, 418
 Ucona Rocks, 826
 Uda-Milai Islands, 963
 Uda sima, 800, 912-13
 Udauzeri Bay, 863
 Uedle, 708
 Uge-gouk, River, 687
 Ugly Channel, 418
 Uiya nara, 854, 856
 Ujao Islands, 962, 964
 Ujilong Islands, 969-970
 Uke sima, 1148
 Ukiga saki, 1151
 Ukinsk Bay, 726
 Uki sima, 841
 ——— take Peak, 883,
 Uku sima, 891
 Ulak Island, 681
 Ulakhta Bay, 673
 Uliaga Island, 676
 Uli Islands, 1001
 Ukhini Islands, 1004-5
 Ulonnia Bay, 1047
 Ulul Island, 997
 Ulya, 746
 Ulysses Cove, 772
 Uma sima, 790, 791, 797
 Umata Bay and River, 1043
 Umnak Island, 674
 Umol Island, 995
 Umpquah River, 288-9
 Unalakleet, 693

Unalaklik, 693
 Unalaska Bay, 672, 673
 Unawb Island, 1005
 Unimak Island, 670
 Union Bay, 562
 ——— Island, 58, 437, 438
 ——— Passage, 544
 Uniontown, 270
 Unit Rock, 365
 Unkofski Island, 772
 Unwelcome Harbour, 985
 Upho n River, 692
 Upolu Point, 1078
 Upright, Cape, 703
 ——— Channel and Hill,
 359-360
 Upwood Point, 485
 Uraga, 834
 ——— Channel, 825, 829,
 833-4
 Ura-kami Harbour, 817
 Urukawa Bay, 864
 Uranie Bank, 998
 Ura-no-Utai, 787
 Urava Island, 16
 Urbitch, 741
 Uri sima, 898
 Urracas Islands, 1058, 1059
 Ursula Channel, 533
 Urukthapel Island, 1011,
 1013
 Urup Island, 736, 740
 Usalghin Bay, 748
 Usé Rock, 886, 913
 ——— Rocks, 1144
 Useless Bay, 334, 558
 ——— Inlet, 413
 Ushi-ga no kubi, 889
 Ushishir Island, 739
 Usi sima, 890
 Ustritzia Island, 762
 Usu, Cape, 866
 Usubre River, 36
 Usuri, River, 765
 Usui Volcano, 864
 Utirik Islands, 950, 952, 960
 Uthoa, 942
 Utki lokaki, Cape, 744
 Utone Islet, 843
 Utsalady, 343
 Ut-te-was, 582
 Uwa sima, 795
 Uyama Peak, 915
 Uyelang Island, 969, 970
 Uzen Volcano, 907
 Vagares I-lets, 43
 Vakhilskais, River, 729
 Vaksel, Cape, 721
 Valdes Island, 383, 491, 495
 ———, Puerto de, 645
 Valetta Reef, 1138
 Vali, Cerro, 9
 Valientes Islands, 987
 Valadolid Rock, 16
 Valle de Banderas Bay, 111
 Vallojo Bay, 249
 Vallenar, Point, 598
 Valparaiso, 1258, &c.

INDEX.

- Vancouver (Burrard Inlet),
 466 (Columbia River),
 298, 310
 Bay, 487
 Cape, 690
 Island, 322, 349—
 350, 388—453, 468—480,
 494—513, 529—530, 1251
 Vandalia Bluff, 827
 Vandeput, Point, 608
 Vanderbilt Point, 617
 Reef, 618
 Van Dieme Strait, 783-4,
 1145, 1186, 1208, 1261
 Vanuatu Island, 608
 Varchalam, Cape, 744
 Vargus Cone, 419
 Island, 420
 Vashon Island and Point,
 337, 338
 Vasilova Rock, 630
 Vasilovka Rocks, 630
 Vasilief Reef, 657
 Vcevidovskia Cove & Ids.,
 676
 Vcevidovskies Islands, 675
 Vcevidovskoi Volcano, 675
 Vela Rock, 1138, 1139, 1140
 Velas, Cape, and Puerto, 41
 latinas, Islas de las,
 1037
 Velasquez Island, 58
 Venado Island, 18, 121, 123,
 124, 125, 141
 Vendovia Island, 347
 Venn Creek, 561
 Ventana Bay, 172
 Island, 27
 Point, 23
 Ventosa Bay & Point, 87-8
 Island, 616
 Ventura Rocks, 230
 Venus Shoal, 183
 Versagua, 3, 17
 Verde, Monte, 136
 Rio, 96
 Verdure Point, 567
 Verkhotoorsky Island, 721
 Vermejo, Mar, 129
 Vermilion Sea, 129
 Vernacci, Braso de, 501
 Verney Channel, 533
 Passage, 519
 Vernon Bay, 415
 Vertical Point, 576, 578
 Vesuvius Bay, 378
 Vicente, Point, 212
 Victoria, Harbour, & Light,
 350, 392, 399-400
 Bay, 1020
 Island, 222
 Mount, 487
 Victorieuse Island, 1145
 Rocks, 1153
 Viejo Volcano, 51, 55
 Vigia Hill, 177, 216
 Grande Hill, 105
 Vigilant Point, 495
 Village Bay & Islands, 579
 Island, 441, 655
 Islet, 448
 Passage, 417
 Point, 347, 477
 Rocks, 413
 Villeuchinski Volcano, 728,
 731
 Vincennes Bay, 1148
 Straits, 1142
 Viner Point, 492
 Vineta Bank, 888
 Vinorama Island, 134
 Violin, Punta, 35
 Vique Cove, 16
 Viradores Islands, 42
 Virago Rock, 385
 Sound, 584
 Virgen de Dolores, 164
 Virgenes, Cape, 153
 Cape, and Bay,
 198, 200
 Island, 199
 Virgin Rocks, 515
 Virginia, Mount, 769
 Virginia Bay of, 198
 Virkhovski Islands, 770
 Virst, Cape, 751
 Vitkeari Island, 630, 632
 Viuda Rock, 27
 Viveros Island, 8
 Vladimir Bay, 716
 Vladivostok, Port, and Ids.,
 766, 771
 Vreshni, Cape, 746
 Voeroda Bay, 770
 Volano Island, 28, 29
 Volcan Island, 1125
 Volcano Bay, 863-4
 Hill, 1090
 Island, 844, 846,
 1143, 1145
 Islands, 1136-5
 Von Donop C oek, 491
 Vostok Bank, 763, 764
 Bay, 772-3
 Vouten, River, 715
 Vozdvjenia, Cape, 759
 Vries Island, 828, 839, 842-3
 Vulcan Island, 1020
 Waaddah Island, 327
 Wachusett Cove, 621
 Wada no misaki and Light,
 808
 Waiasima Harbour, 811
 Waddington Harbour, 494
 Wafer Bay, 925
 Waikana Bay, 1073
 Waialeai Harbour, 1093
 Waialeale Mountain, 1100
 Waianna, 1093
 Waikiki, 1099
 Waiholi Mountain, 1100
 Wailua River, 1101
 Wailuku, 1087
 Waimanu Valley, 1077
 Waimea Bay (Kauai), 1100,
 1101-2 (Oahu), 1093,
 1094 District, 1079, 1080
 Wainwright Inlet, 700
 Waiaru, 1023
 Waiasima Bay, 876
 Wakamatau sima, 893
 Wakasa Bay, 877-9
 Waka yama, 811
 Wakeman Sound, 602
 Wakenenish Island, 419
 Wakes Island, 1035-6, 1120
 Wailala River, 263
 Walekonser Bay, 1021
 Waldron Island, 357, 371
 Wales Island & Point, 561
 Walker Bay, 1130, 1134
 Cove, 596
 Hook, 384
 Island, 308
 Islands, 926
 Islands and Rocks,
 610-11
 Point, 520
 Wallace Bight, 531
 Wallajah River, 314
 Waimouth Hill, 352
 Walpole, Point, 610
 Wal-russia, 592
 Walvis Islands & Bay, 741,
 866
 Wanderer Island, 574
 Wandering Minstrel Bank,
 999
 Wappaton Island, 309
 Ward Harbour or Cove, 598
 Warde, Point, 600
 Waré Rock, 1148
 Wark Channel, 556, 561
 Island, 533
 Warn Bay, 424
 Island, 423
 Warren Island, 605
 Hastings Id., 1026
 Warrior Point and River,
 309
 Rocks, 557
 Warsick Island, 1008
 Wasaki, 873
 Washington Harbour, 330
 Island, 568, 930
 Mount, 478
 Territory, Coast
 of, 277, 311—348
 Wasinoko, 864
 Wasiau yama, 876
 Wasp Islands and Passage,
 356, 361-2
 Wasiloff Bay, 605
 Watanaka, 850
 Watanaka, 850
 Watauski, Cape, 775
 Watch Rock, 515
 Watcher Islets, 544-5
 Waterfall Creek and Light,
 1073, 1074
 Waters, Point, 646

Water Rock, 784-5
 Watson Bay, 531
 — Rock, 537
 Waxell, Cape, 721
 Waywoda Rock, 915
 Wedge Island, 108, 449,
 600
 Wedge-shaped Cape, 670
 Weekeno, 518
 Weeks Island, 928, 1126
 Welcome Harbour, 525
 Wellies Harbour, 1118-1120
 Wollington, 471, 472
 — Isles, 978
 Wolf's Passage, 503
 Wessiloffsky, Cape, 672
 West Arm, 450
 — Forland, 653
 — Point and Lighthouse,
 335-6
 — Rock, 526
 — Rocks, 438
 — Sound, 362, 363
 Westcott Creek, 371
 Western Reef, 412
 Westervelta Islands, 990
 West Fain Islet, 999-1000
 — Sitkhin Island, 682
 Westminster Point, 523
 Weynton Passage, 501, 504
Whale Fishery, 635-6, 664,
 684, 742, 943, 1065
 Whale Channel, 148, 534,
 544
 — Creek, 296
 — Head & Reef, 1155,
 1156
 — Island, 707
 — Rock, 189, 398
 — Rocks, 355
 Whaleman Anchorage, 929
 Whaler Island, 228, 273
 Whaley, Point, 596
 Whatcom, 347
 Wheeler Islet, 546
 Wheelock Pass, 523
 Whidbey Island, 334, 342,
 343
 Whiffin Island, 394
 Whil-a-pah River, 314
 Whirlwind Bay, 520
 White Islet, 105, 108, 483,
 489
 — Point, 162
 — Rock, 95, 108, 149,
 151, 163, 353, 357, 371,
 376, 378, 482, 511, 512
 — Rocks, 516, 527, 548,
 560
 — Spit, 477
 — Stone, 528
 — Beach Bay, 363
 — Cliff Bay, 769
 — Head, 438
 — Island, 525,
 538
 — Islet, 553
 — Point, 482
 — North Pacific.

White Friar Rocks, 102
 — Pine Cove, 425
 — Rock Point, 812
 — Spruce Cape, 656
 — Water Bay, 613
 Whitehorn Point, 347
 Whitesand Islet, 559
 Whitestone Narrows, 627
 — Point, 449
 Whiting Harbour, 631
 Whitshed Bay, 793
 Whitsunday, Cape, 660
 Whyatea, 1074
 Whynea Bay, 1094
 Whyteco Bay, 1099
 Wide Pass, 969
 Wilder Bay, 770
 Wilfred Point, 496
 Willamette River, 309-310
 Willard Point, 142
 Willos Island, 503
 William Head, 396
 — Island, 529, 557
 — IV. Islands, 986
 — Henry Harbour,
 615
 Williams Reef, 557
 Williamson Rocks, 345
 Willoughby Cove, 623
 — Island, 622
 Willow Point, 494, 495
 Wilmington & Lighthouse,
 212-214
 Wilson Creek, 273
 — Island, 789, 881,
 1034
 — Islands, 1001
 — Point and Lt.-ho.,
 331
 — Rock, 226-7
 Wimbets River, 871
 Wimbledon, Point, 623, 624
 Winchester Bay, 289
 Winchelsea Island, 474
 Winchester, Mount, 769
 Windham Point, 616
 WINDS, 1166-1193
 The General Arrange-
 ment, 1166; Limits of
 the Trade Winds, 1167
 — 1169; Winds North
 of Guayaquil, 1170;
 Choco Bay, 1170; Chi-
 rambira Point to the
 Gulf of San Miguel,
 1171; Gulf of San Mi-
 guel to the Gulf of
 Dulce, including the
 Bay of Panama, 1171;
 Between the Galapagos
 Islands and the Coast,
 1171-1172; Gulf of
 Dulce to Fonseca, Te-
 huantepec, and Teju-
 pan Point, 1172; West Coast
 of Mexico, 1173; Cali-
 fornia, &c., 1174-
 1177; Vancouver Id.,

WINDS—continued.
 Alaska, &c., 1178-1181;
 Behring Sea, 1181;
 Kamchatka, 1182; Sea
 of Okhotsk, 1182; Gulf
 of Tartary, 1183;
 Japan, 1181-1190;
 The Islands, 1190;
 Typhoons, 1191-1193
 Aian, 1183
 Alaska, 1178
 Amur River, 766, 1183-
 1184
 Anadyr River, 1181
 Astoria, 1176, 1177
 Avacha Bay, 731
 Baker Island, 934
 Bonin Islands, 1129
 British Columbia, 514
 California, Coast of, 206-
 207, 1175, 1176-7
 — Gulf of, 130-1
 Caroline Archipelago,
 972-5, 1190
 Central America, 4-5
 Chubasco, 5, 79
 Cordonazo, 83-4, 119, 131
 Dai, 1184
 Dulce, Gulf of, 34
 Esquimalt, 398
 Georgia, Strait of, 474
 Gilbert Archipelago, 938-
 939
 Guaymas, 138
 Helen Reef, 1025-6
 Hiliuk, 1181
 Japan, 780-782;
 Juan de Fuca Strait, 324,
 330
 Korea Strait, 1188, 1189
 Kurile Islands, 1182, 1187
 Ladrone Islands, 1190
 La Paz, 169
 La Pérouse Strait, 1183
 Linschoten Islands, 1147
 Lower California, West
 Coast, 178
 Lu-chu Islands, 1147
 Mariana Islands, 1040 1,
 1169, 1190
 Marshall Archipelago,
 952
 Mazatlan, 124
 Mejaco-sima Ids., 1157
 Mexico, West Coast of,
 83-4
Monsoons, 972, 1041
 Mumuk, 1080
 Nikolaidsk, 1184
 Nipon Island, 1188
 Okhotsk, 1183
Papagayo, 41, 54
 Pelow Islands, 1040
 Petropavlosk, 1182
 Ponapi Island, 986
 St. Paul Harbour, 1180
 — Island, 1181
 — Sulpian Island, 1051
 8 E

Winds—continued.

San Blas, 115, 118-120
 — Diego, 1176, 1177
 — Francisco, 1176-7
 — Juan del Sur, 46, 47
 Sandwich Islands, 1966-
 1053, 1169, 1190
 Seto Uchi, 1186
 Sitka, 1150
Terral, El, 6
 Taugar Strait, 854-5,
 1187
 Vancouver Island, 390-2
Virason, La, 5
 Yap Island, 1007
 Yedo, Gulf of, 1156
 Yezo Island, 1187
 Windy Islets and Rock,
 543
 Wingham Island, 642
 Winter Cove, 368
 — Harbour, 448, 450
 Wise Island, 393
 Withart Reef, 990
 Witshed, Cape, 643
 Wizard Island, 413
 Wohoo Island, 1092
 Woodhouse Point, 629, 634
 Woowodaki Harbour, 608
 — Island, 602
 Woies Islands, 1001-3
 Woies Island, 995
 Wolf Island, 394
 — Point, 345
 — Rock, 525, 606
 Woman of the Period
 Rock, 212
 Women Bay, 656
 Wood Hill, 1150
 — Island, 246, 528
 — Islands, 422
 — Rocks, 516
 Woodcock Landing, 549
 — Point, 647
 Wooded Island, 657
 Wooden Rock, 612, 619
 Wooden Passage, 1014
 Woodie Island, 936, 945
 Woody Island, 658
 — Island Channel, 307
 Woolridge Island, 483
 Work Channel, 556, 561
 Worcombe Island, 482
 Woronzow, Point, 654
 Wotje Islands, 952, 958-9
 Wotho Islands, 962, 963-4
 Wrangel Bay, 773
 — Channel, 602
 — Fort, 593, 601
 — Island, 601
 Wrangell Island, 701-2
 Wreck Bay, 419
 — Point, 548
 Wright Sound, 524
 Wukido sima, 1149
 Wurasuga Bay, 878
 Wurato Inlet and Light,
 767

Wurst, Cape, 751
 Wusimado, Port, 803-4
 Wydda Island, 327
 Wyanda Rock, 627
 Wymoa, 1101

Xicolapa River, 80
 Xima, Cape, 819
 Ximotepe, 48
 Xipangu, 777
 Xochwan, 564

Yacioris, Cerro, 136
 Yaga-ji Island, 1154
 Yagisiri Island, 871
 Yaguchi ura, 818
 Yabiko yama, 875
 Yakaiichi, 822
 Yakang Island, 1155, 1156
 Yake yama saki, 856
 Yakunt, Cape, 1155
 Yakou, Cape, 836
 Ya-koun River, 583
 Yaktaga, Cape, 640
 Yakuno sima, 1143
 Yakuno Reef, 1143
 Yakuta Bay, 636
 Yalc, 460
 Yam Bay, 1104
 Yamada Harbour, 652-3
 Yama gawa, 784
 Yamakusanai, 864
 Yamata ura, 805
 — Iso, 808
 Yamato guchi, 1151
 Yanagi Islet, 1156
 Yaneo, 894
 Yaniakimon, 712
 Yankee Blade Rocks, 227
 Yap Island, 971, 1005-7
 Yaqui Bay and River, 136
 — Rio, 169
 — Sierra, 137
 Yaquina Head and Light-
 house, 292
 — River and Bay,
 290-2

Yaquinnah River, 293
 Ya saki, 873
 Yasha Island, 608
 Ya sima, 795, 796
 Yasman Take Hill, 887
 Ya-tsa, 584, 585
 Yoboya sima, 1156
 Yebian, 873
 Yeboshi yama, 836
 Yebosi sima and Light-
 house, 882
 Yebukuro no minato, 887
 Yedo, 779, 781, 782, 834,
 837, 838-9
 — Bay, 778, 825, 834-9
 — Gulf of, 825-833, 1186
 — Rock, 768
 Yei Bay, 805
 Yellocki, 526

Yellow Bluff, 564

— Island, 362, 374, 476,
 478

— Point, 377

Ye mura, 821
 Yeno sima, 889
 Yenkido Inlet, 836
 Yeno sima, 890, 890, 890
 Yeno ura, 823, 824
 Yeo Island, 474
 Yerba Buena, 238, 240
 — Island, and

Lighthouse, 246-7
 Yerghin, Point, 713
 Yerimo, Cape, 865
 Yerabu sima, 1143, 1149-
 1150, 1150
 Ye saki and Lighthouse,
 804

Yean, Cape, 857, 863
 Ye sima, 803
 Yessabi, 867, 868
 Yeterop Island, 740
 Yetomo saki, 864
 Yotorup Strait, 740
 Yaso Island, 755, 778, 779,
 867-861, 862-871, 1187
 — Strait, 867

Ykimah Island, 1160, 1161,
 1162

Ykitah Island, 886
 Yk-ik, Cape, 659
 Ylipo River, 111
 Ynarajan Bay, 1047
 Yobuko Harbour, 884-5
 Yodo gawa, 805
 Yodabi Rock, 792
 Yokohama and Lights, 779,
 780, 807, 836-8, 1260, &c.
 Yokoso, Cape, 855, 872
 Yokone Rocks, 826
 Yoko sima, 798, 799, 886,
 888, 1146

Yokoaka Harbour, 836
 Yolk Point, 544
 Yori sima, 1153
 York, Cape, 697
 — Islet, 562

Yoshiku misaki, 908
 Yo sima, 800
 Yosino Head, 801
 Youchin, Cape, 722
 Younsaka Island, 676
 Young Islet, 345
 — Point, 611
 — Point, Bay, and
 River, 305

Youp-nut, River, 697
 Ystapa, 90
 Yubets, 864, 868
 Yugo sima, 799
 Yu-quot Point, 432
 Yukon River, 691-3
 Yulap, 864
 Yule Islet, 442-3
 Yuma, Fort, 145
 Yu no ura, 884
 Yura, 808, 809

INDEX.

1315

Yura Bay, 796
Yura no uchi, 812-13
Yuri sima, 796
Yu sima, 907
Yutai sima, 877

Zacatala, Rio, 108
Zadan, Cerro, 98
Zakharovskaya Bay, 666-7
Zamami sima, 1165, 1186
Zamok, Cape, 773
Zapadnaia Bay, 762

Zapadni Bay, 708
Zapatera Island, 49
Zapote, 77
 Island, 49
Zarembo Island, 603
Zarpane Island, 1047
Zavalichine, Cape, 980
Zayao Island, 669, 699
Zealandia Rocks, 1055
Zebalico Arm, 436
Zedsones Islets, 30
Zenobia Rock, 631

Zero Rock, 368
Zet Island, 1017
Zesontlatl, Rio, 70
Zipegua, Piedra and Punta
 de, 89
Zoga saki, 811
Zonsonato, 75
Zouboff Islands, 704
Zuciarie Channel, 431
Zuniga, Barros de, 209
Zuniga, Point, 198, 199

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